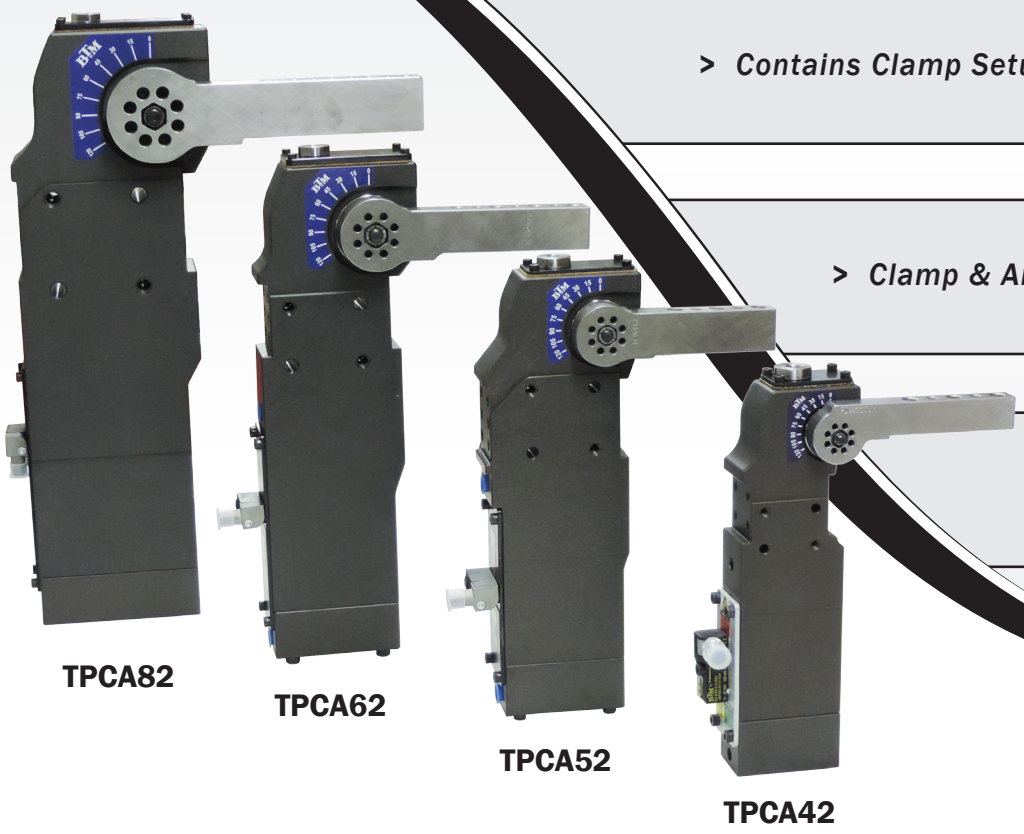
TPCA POWER CLAMPS USER GUIDE

Pneumatically Operated, Weld-Contamination Sealed, Heavy Duty Power Clamps



> *Contains Clamp Setup & Re-Order Information*

> *Clamp & Arm Dimension Information*

> *Maintenance Information*

... and more.

Contains information on TPCA-82, 62, 52, and 42's!

http://www.btmcomp.com/tpca-power-clamps.html

BTM® COMPANY

www.btmcomp.com

810-364-4567

IMPORTANT!

Read this manual completely prior to operation of the Power Clamp.

SAFETY NOTE

It is the customer and/or user's responsibility to provide proper safety controls and/or guarding when a pinch point is present.

CAUTION!

Always disconnect air and electrical supply line before working on or around power clamps!

BEFORE YOU BEGIN

☐ Inspect your TPCA Clamp for damage prior to operation.

For product questions or service issues, contact BTM's sales department at +1-810-364-4567.

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BTM reserves the right to make changes to its literature without any prior notice.
Go to www.btmcomp.com for latest version.

1.0 - INTRODUCTION

Thank you for selecting BTM's patented TPCA model power clamp. Our goal is to provide our customers with the best value in power clamps available. This User's Guide is intended to help you get the most value from the product; please read it through carefully. If you have questions, or have service issues, call BTM at 810-364-4567.

1.1 - TPCA CLAMP FEATURES

- 5 - 120 degree of arm opening adjustability.
- One clamp model for single and dual arm clamps - No need to change internal parts.
- Patented Tri-Lok Mechanism for precision clamping and higher inertia loads.
- Sealed Mechanism - Lubricated for Life of Clamp
- Cushions Standard on Both Advance and Retract Ends
- Self Pumping Slide Rod Lubrication
- Integral Cylinder with Heavy Wall
- Body is constructed of Hard Coated Aircraft Aluminum
- Internal Pin Drive for versatile arm positioning & simplified arm change
- One clamp model for single and dual arm clamps
- Access to manually unlock clamp linkage
- Integrated proximity switches do not need to be readjusted when arm opening is changed.
- Top and Bottom porting

1.2 - TPCA CLAMP SPECIFICATIONS

- Equivalent Bore Sizes: 42.0mm [1.65"], 52.0mm [2.00"], 62.0mm [2.50"], & 82.0mm [3.25"] DIA.
- Arm Rotation (Deg.) 30-120°
- Maximum cylinder stroke for 120° arm opening = **TPCA42** ~ 52.8mm [2.08"]
  TPCA52 ~ 70.28mm [2.77"]
  TPCA62 ~ 93.1mm [3.66"]
  TPCA82 ~ 118.8mm [4.68"]
- Approx. Weight (without arms): **TPCA42** ~ 2.0 kg [4.5 lbs], **TPCA52** ~ 3.8 kg [8.4lbs], **TPCA62** ~ 5.7 kg [12.6 lbs], **TPCA82** ~ 13.6 kg [30.0 lbs]
- Operating Pressure: 2.75 to 7 BAR [40 to 100 PSI] (lubricated or non-lubricated compressed air)

~ Use Flow Controls to Reduce Impact.

- Holding Torque without Air = **TPCA42** ~ 165 Nm [122 ft-lbs]
  TPCA52 ~ 290 Nm [214 ft-lbs]
  TPCA62 ~ 450 Nm [330 ft-lbs]
  TPCA82 ~ 745 Nm [550 ft-lbs]

- Clamping Torque at Hub = **TPCA42** ~ 43.4 Nm [32 ft-lbs @ 5.5 BAR [80 PSI]
  TPCA52 ~ 89.5 Nm [66 ft-lbs @ 5.5 BAR [80 PSI]
  TPCA62 ~ 257.6 Nm [190 ft-lbs @ 5.5 BAR [80 PSI]
  TPCA82 ~ 496.2 Nm [366 ft-lbs @ 5.5 BAR [80 PSI]
- Clamp interchangability tolerance: ±0°15' (Clamp to Clamp)
- Arm repeatability in closed position: ±0°3'

2.0 - DESIGN GUIDELINES

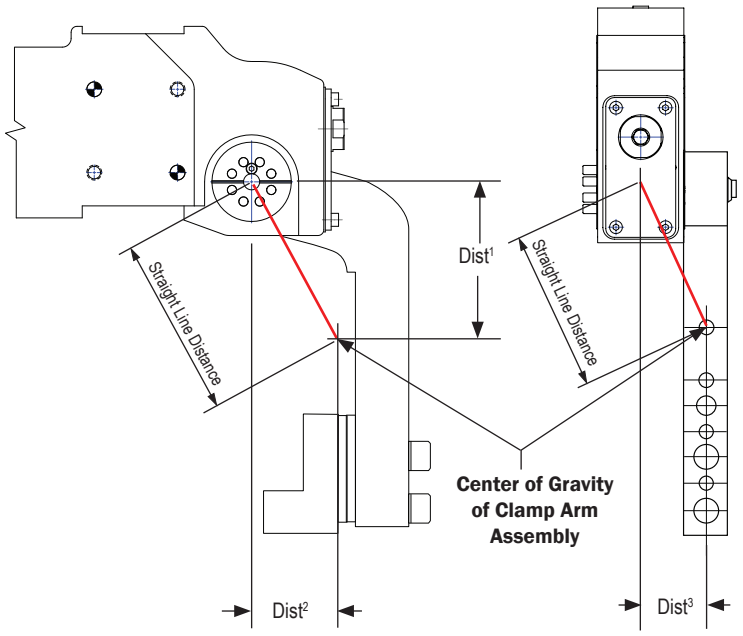
BTM TPCA model clamps, when properly applied, will meet the requirements of the warranty. Selecting the proper size clamp is based on both force and cycle time requirements. The cycle time is affected by the amount of mass on the moving arm assembly. The recommended cycle time is 1 second to open and 1 second to close for a 120° opening clamp.

- Determine the clamp size required for the application. *[Determined by force output requirements - see p. 6]*
- Determine the design of the clamp arm assembly, including the arm, shims, and clamping detail (N/C block).
- Determine the required distance the clamp arm pivot must be located from the clamping point due to the arm length and shape required.
- Determine the Center of Gravity of the clamp arm assembly and its straight line distance to the clamp pivot.
- Use the charts for each clamp to determine if the size clamp will be adequate to support the clamp arm assembly. If not, choose a larger size clamp. [see p. 5]
- When the requirements of the chart are met, the clamp is protected from misapplication by an internal fixed orifice which prevents the clamp from moving too fast causing premature failure. Operating a clamp outside the charted limits will void the warranty.
- Determine the closed clamp arm position and the degree of opening required. Be aware of clearance issues with other tooling and the clamp body itself when determining degree of opening. [see p. 21]
- Orient the clamp in the required mounting position relative to the arm pivot. Consider hose and wire connections, and accessibility to proximity switches.

2.1 - APPLICATION APPROVAL PROCESS

Please contact BTM's authorized Distributors to certify proper application of its TPCA clamps. The figure depicted to the right shows the typical information that is required for application approval. Certification will include an assessment of the cycle rate and the weight of the clamp arm assembly. Any misapplications will be noted, and must be corrected to recieve certification.

The warranty is dependant on certification of the application.

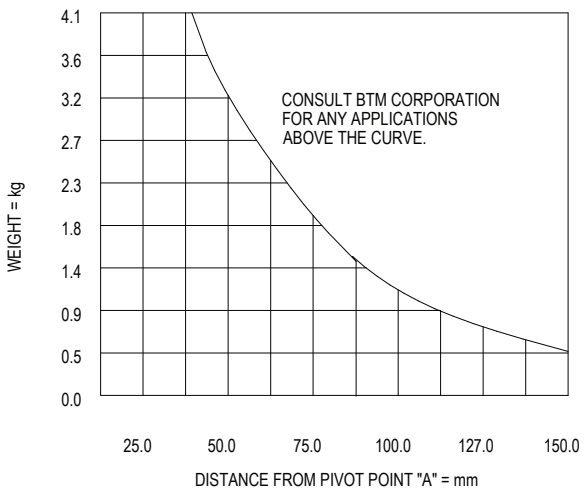


Mass @ Center of Gravity = ____

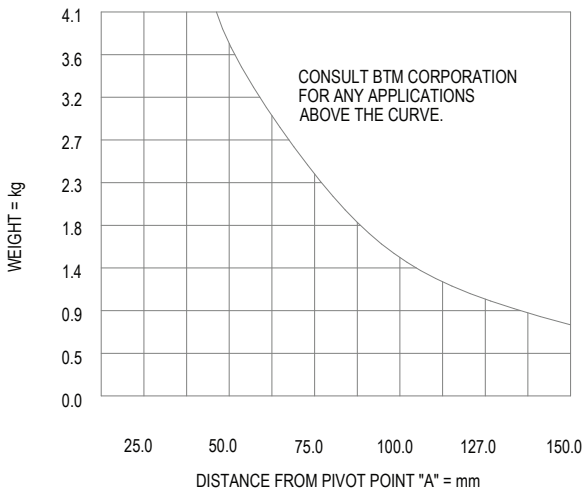
2.2 - MAXIMUM ALLOWABLE WEIGHT OF CLAMP ARM ASSEMBLY

Refer to the charts below for model specific information regarding the recommended allowable weight on the arm at given distances from the pivot. The distance from Pivot Point is the straight line distance from the centerline of the clamp at the pivot point to the center of gravity of the clamp arm assembly. The center of gravity is figured using the weight of the arm plus the total weight mounted on the arm. When using dual arms, add the weight of the second arm to the total weight.

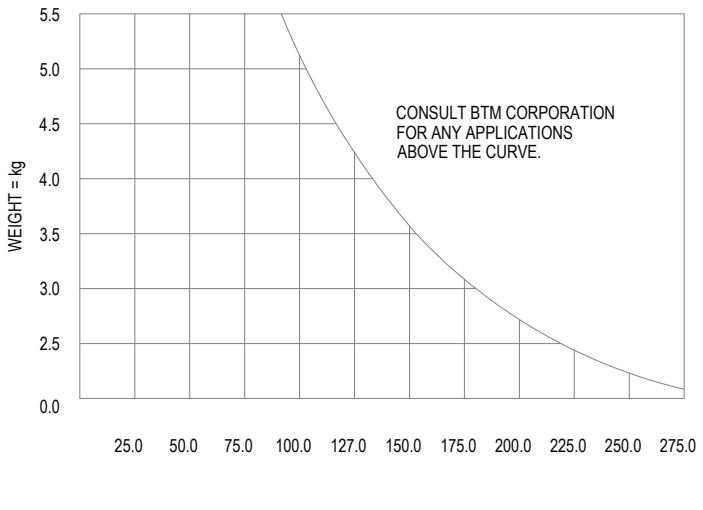
TPCA 42



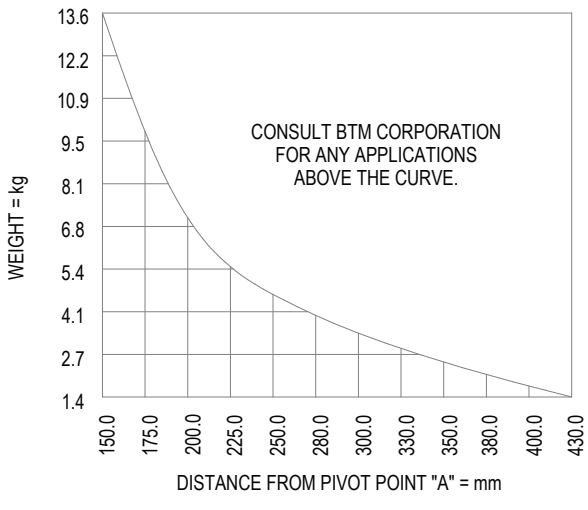
TPCA 52



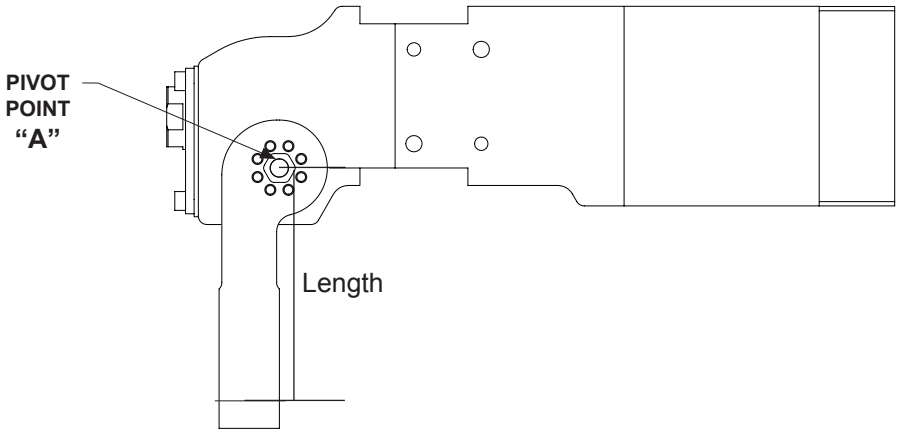
TPCA 62



TPCA 82



2.3 - CLAMPING FORCE



TPCA42 CLAMPING FORCE	
BAR	7910 x Line Pressure (BAR) / Length (mm) from POINT "A" to the center line of clamping contact area on clamp arm
PSI	4.8 x Line Pressure (PSI) / Length (in) from POINT "A" to the center line of clamping contact area on clamp arm

TPCA52 CLAMPING FORCE	
BAR	16500 x Line Pressure (BAR) / Length (mm) from POINT "A" to the center line of clamping contact area on clamp arm
PSI	10 x Line Pressure (PSI) / Length (in) from POINT "A" to the center line of clamping contact area on clamp arm

TPCA62 CLAMPING FORCE	
BAR	46500 x Line Pressure (BAR) / Length (mm) from POINT "A" to the center line of clamping contact area on clamp arm
PSI	28.5 x Line Pressure (PSI) / Length (in) from POINT "A" to the center line of clamping contact area on clamp arm

TPCA82 CLAMPING FORCE	
BAR	92000 x Line Pressure (BAR) / Length (mm) from POINT "A" to the center line of clamping contact area on clamp arm
PSI	55 x Line Pressure (PSI) / Length (in) from POINT "A" to the center line of clamping contact area on clamp arm

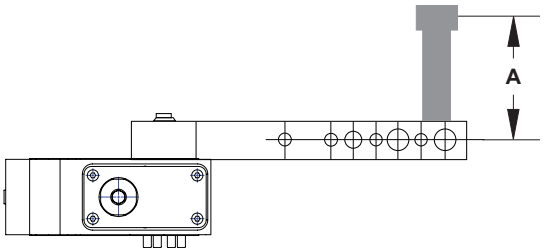
2.4 - PERMISSIBLE CLAMP OFFSET DISTANCE

TPCA42
A = 30.0mm

TPCA52
A = 37.5mm

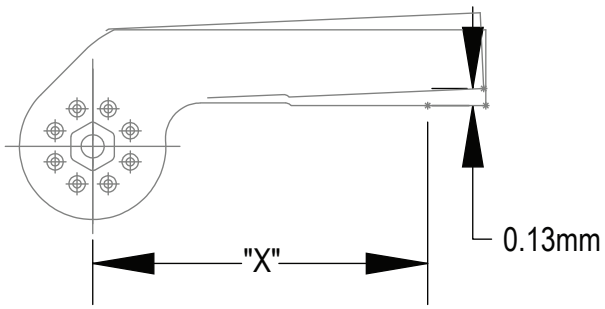
TPCA62
A = 75mm

TPCA82
A = 150mm



2.5 - ARM DEFLECTION UNDER LOAD

Force on arm at “X” distance from pivot resulting in 0.13mm [.005”] Maximum deflection.



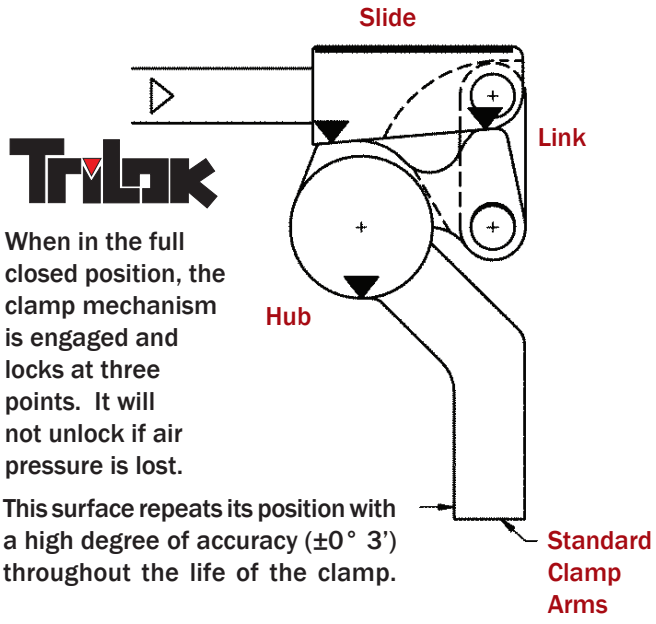
TPCA42	
“X” (mm)	Force (N)
125	88
100	144
75	200

TPCA52	
“X” (mm)	Force (N)
125	113
100	165
75	290

TPCA62	
“X” (mm)	Force (N)
250	156
225	200
200	245
175	289
150	378
125	489
100	734

TPCA82	
“X” (mm)	Force (N)
370	165
340	205
310	267
280	365
250	449
220	623
190	1005
160	1397
130	2073
100	3065

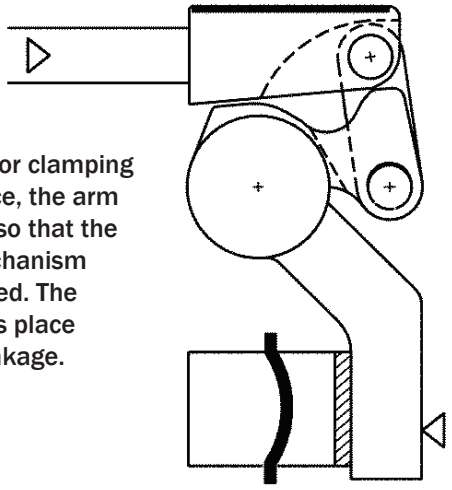
3.0 - APPLICATION GUIDE



TriLok

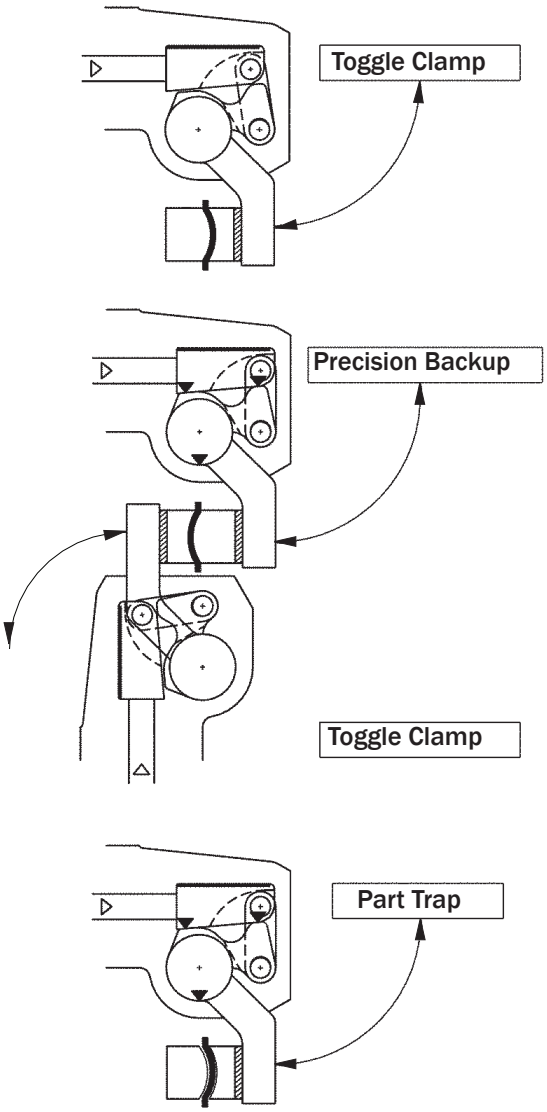
When in the full closed position, the clamp mechanism is engaged and locks at three points. It will not unlock if air pressure is lost.

This surface repeats its position with a high degree of accuracy (±0° 3') throughout the life of the clamp.



When used for clamping the workpiece, the arm is shimmed so that the TRI-LOK mechanism is not engaged. The locking takes place within the linkage.

Ways of Using the TRI-LOK Mechanism

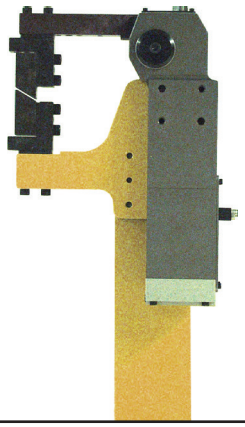


3.1 - HOW TO MOUNT THE CLAMP

Oval style TPCA clamps have standard NAAMS style mounting hole patterns. Always use dowel pins in addition to the mounting screws to maintain accurate location. Mounting screws should be tightened to the following torques:

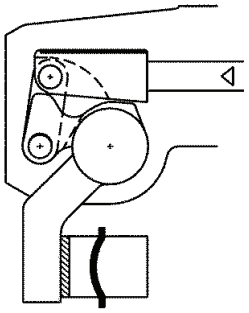
TPCA42 =	[M6 Screw]	15 Nm (11 ft-lbs)
TPCA52 =	[M8 Screw]	37 Nm (27 ft-lbs)
TPCA62 =	[M10 Screw]	72 Nm (53 ft-lbs)
TPCA82 =	[M12 Screw]	126 Nm (93 ft-bls)

Weldments or other mounting provided for the clamp must be of sufficient rigidity to allow consistent delivery of the force required by the application.



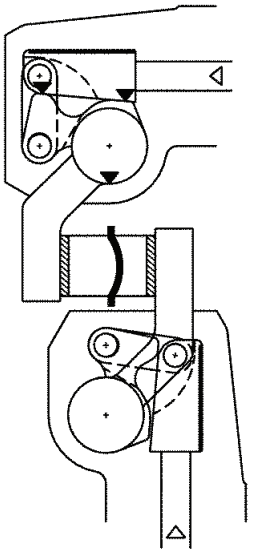
3.2 - MOUNTING THE TPCA CLAMP AS A TOGGLE CLAMP

When used for clamping the workpiece, the arm is shimmed so that the TRI-LOK mechanism is not engaged. The locking takes place within the linkage.



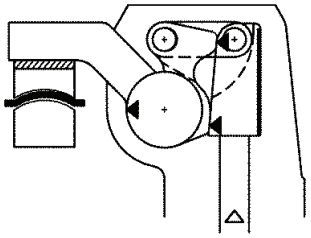
3.3 - MOUNTING THE TPCA CLAMP AS A PRECISION BACKUP

When using the TPCA clamp as a precision backup, allow the clamp to fully close and engage the Tri-Lok mechanism. Because of the precision of the Tri-Lok mechanism, the TPCA clamp will repeat its closed arm position ±0° 3'. Due to this precision, it is not required to use an external hard stop on the backup arm to maintain position, as long as 3' is acceptable. If an external hard stop is used, do not put more than 0.13mm [.005"] of press on the hard stop. Over-shimming of the hard stop could cause the clamp to remain locked in the closed position even after air pressure is applied to open the clamp. When mounting the back-up clamp, ***do not*** rotate the clamp 1° forward as this could have the same effect as an over-shimmed condition.



3.4 - MOUNTING THE TPCA CLAMP AS A PART TRAP

When used as a part trap, the clamp arm should be allowed to come fully closed, engaging the Tri-Lok mechanism. Shim the clamping detail to achieve the desired amount of clearance between the clamping detail and the part. When shimming the clamp detail, you should allow for the addition, or removal of shims to account for variances in the part thickness.



4.0 - ORDER INFORMATION

4.1 - HOW TO READ THE CLAMP LABEL

The label affixed to a BTM clamp contains the following information:

Job Number : Used for tracing information.

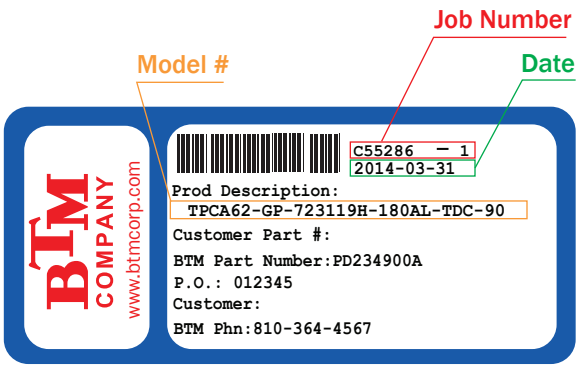
Date : Date clamp was shipped from BTM.

Model Number : Indicates Clamp size, port type, degree of arm opening, arm number, arm position and location, and switch number.

P.O. : Distributor purchase order to BTM.

Tag # : Indicates customer purchase order.

Contact Information : Distributor identification and contact number.



Typical BTM TPCA clamp label

4.2 HOW TO ORDER

Use the following nomenclature to order TPCA Clamps.
See *3.2 HOW TO ORDER REFERENCE SHEET* for more information.

CLAMP					LEFT ARM					RIGHT ARM					SWITCH		PRESET
TPCA	62	G	P	-	723119H	180	A	L	-	723119H	180	A	R	-	TDC	-	90
CLAMP SERIES	CLAMP SIZE	PORT OPTION	HUB CONNECTION TYPE		BTM ARM NUMBER	ARM POSITION	ARM ORIENTATION	ARM SIDE		BTM ARM NUMBER	ARM POSITION	ARM ORIENTATION	ARM SIDE		SWITCH STYLE		PRESET ARM OPENING (DEFAULT IS 90°)

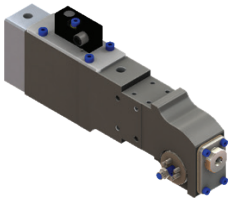
CLAMP CALLOUT CODES	ARM CALLOUT CODES	SWITCH	PRESET ARM OPENING
CLAMP SERIES TPCA	**BTM ARM NUMBER** Leave left or right arm blank if single arm desired.	**NS** No Switch *[Includes Cover Plate + Screws]*	30 45 60 75 90 105 120
CLAMP SIZE 42, 52, 62, 82	**ARM POSITION** 0, 45, 90, 135, 180, 225, 270	**TDC** Turck DC *[Standard on TPCA52, 62, 82. Not Available on TPCA42.]*	
PORT OPTION N = N.P.T. G = G	**ARM ORIENTATION** A = standard B = inverted	**TAC** Turck AC *[Available on TPCA52, 62, 82. Not Available on TPCA42.]*	
HUB CONNECTION TYPE P = pin hub	**ARM LOCATION** L = left side of clamp (viewed from front) R = right side of clamp (viewed from front)	**BDC** - *TPCA42 ONLY* Turck DC *[Standard on TPCA42. Not Available on TPCA52, 62, 82.]*	
		BAC - *TPCA42 ONLY* Turck AC *[Available on TPCA42. Not Available on TPCA52, 62, 82.]*	

Use either arm position callout (L or R) for a single arm clamp. Use both arm position callouts for a dual arm clamp.
Note: If an order option is not required, leave it out of the order number. DO NOT use zeros (0) as place holders.

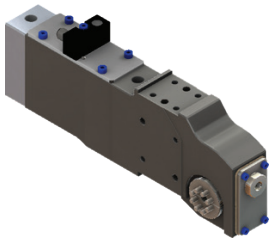
4.3 - HOW TO ORDER REFERENCE SHEET

CLAMP

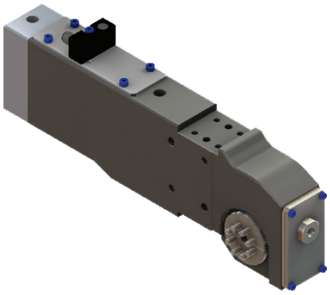
CLAMP SIZE



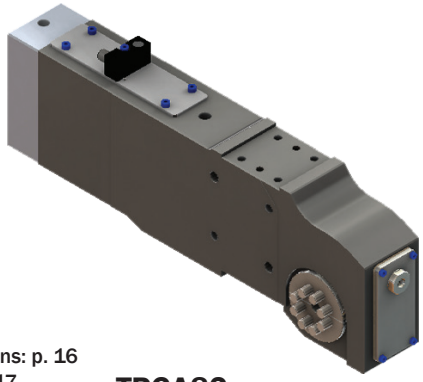
TPCA42
Pin Hub Clamp Dimensions: p. 12
Pin Hub Clamp Arms: p. 13



TPCA52
Pin Hub Clamp Dimensions: p. 14
Pin Hub Clamp Arms: p. 15



TPCA62
Pin Hub Clamp Dimensions: p. 16
Pin Hub Clamp Arms: p. 17

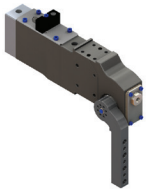


TPCA82
Pin Hub Clamp Dimensions: p. 18
Pin Hub Clamp Arms: p. 19

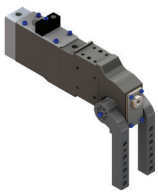
PORT OPTION - See Dimensions for more info. [**TPCA42**= p.12, **TPCA52**= p.14, **TPCA62**= p.16, **TPCA82**= p.18]

ARMS

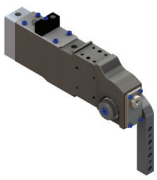
ARM LOCATION



Left Arm



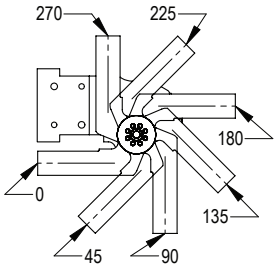
Dual Arms



Right Arm

ARM POSITION

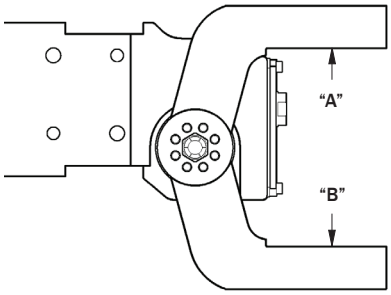
See pg. 21 for max arm opening tables



Clamp Shown in Closed Position

ARM ORIENTATION

See pg. 21 for max arm opening tables



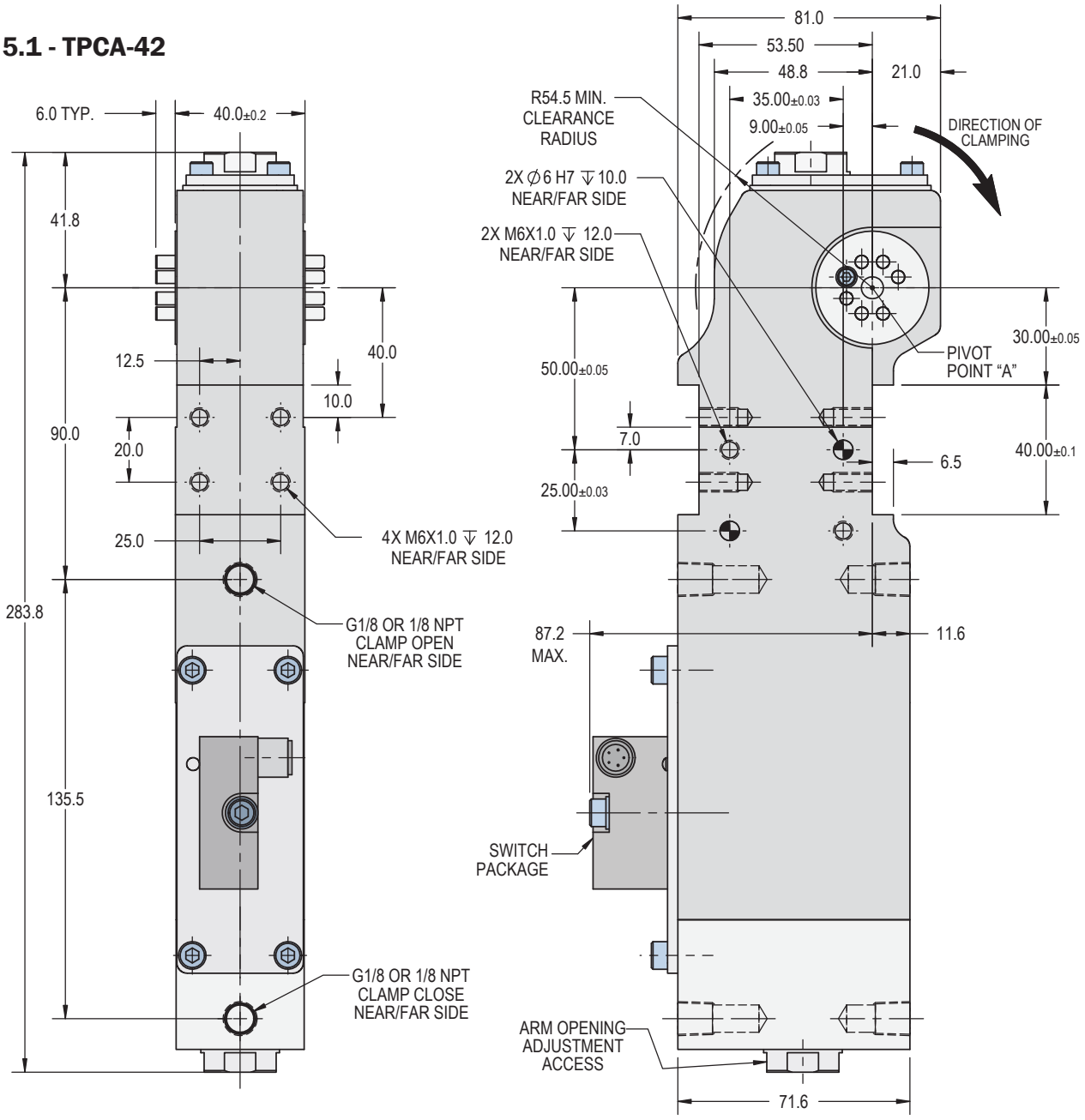
SWITCH

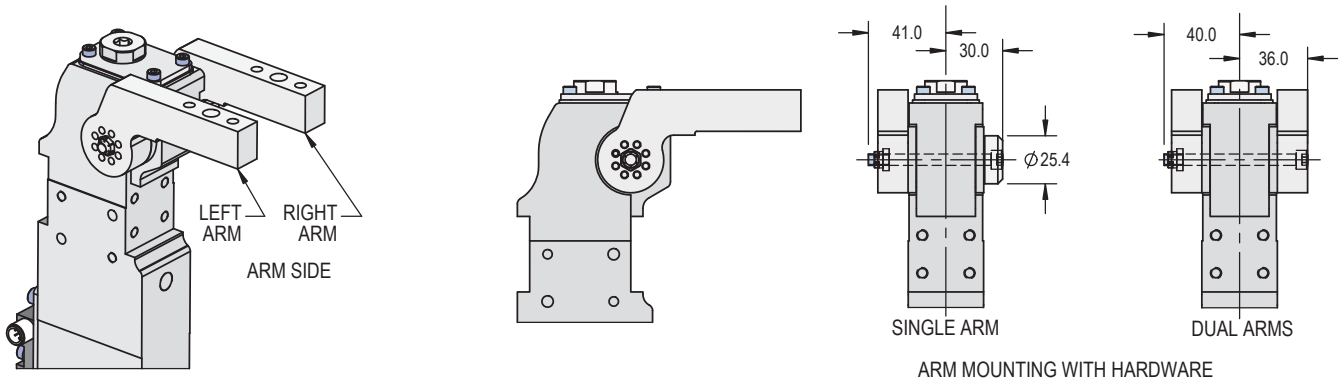
See p. 24 for Switch Information.

Note: Optional switches may be available upon request
(including Turck AC [TAC] for TPCA52, 62 & 82 or [BAC] for TPCA42).
Contact BTM for price and delivery information.

5.0 - DIMENSIONAL INFORMATION

5.1 - TPCA-42

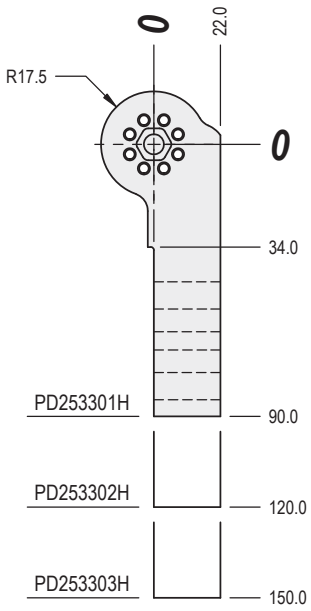


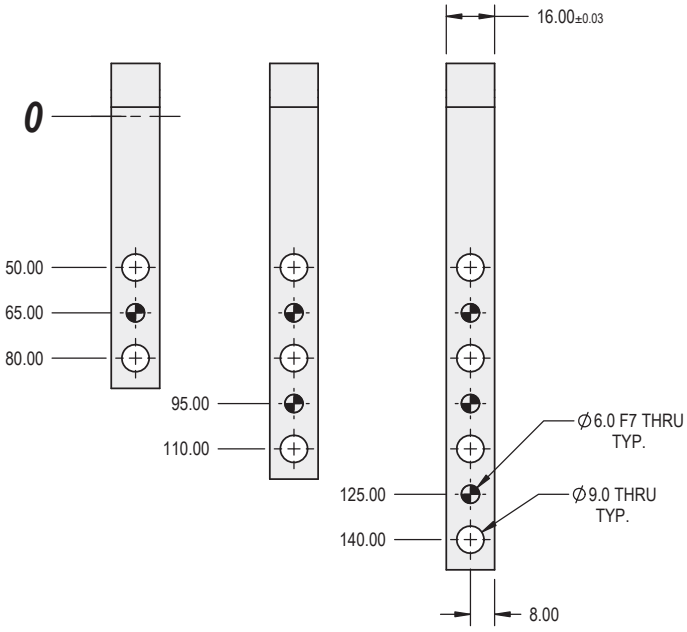


ARM MOUNTING WITH HARDWARE

5.1.1 - TPCA-42 ARMS

STRAIGHT ARM





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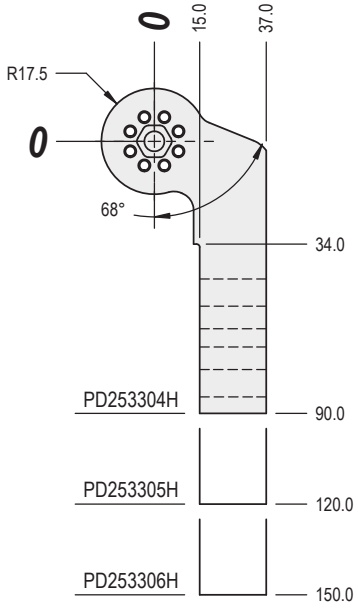

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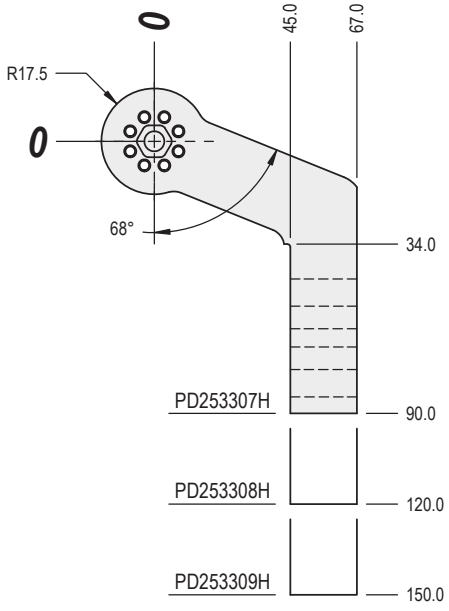
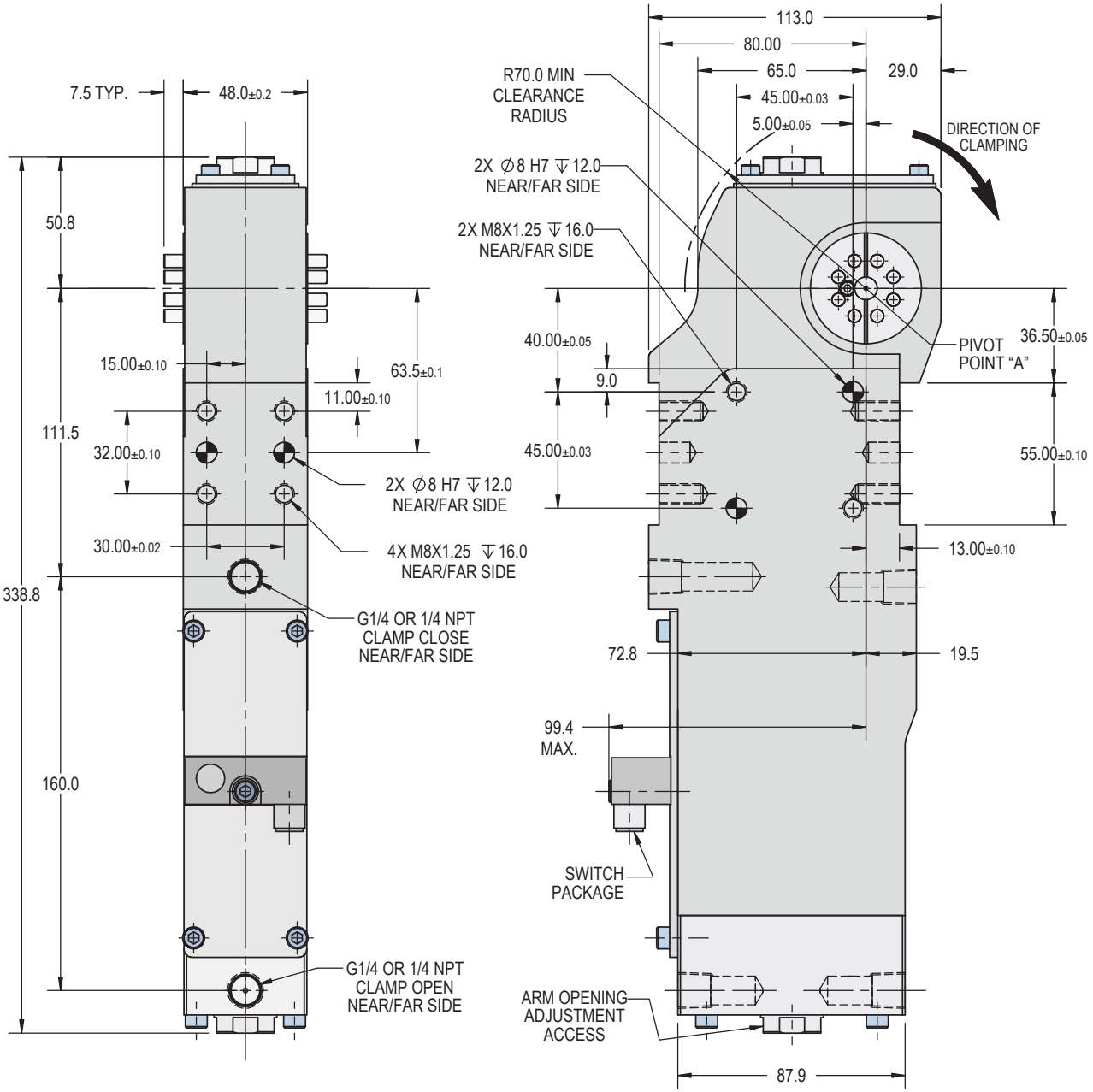
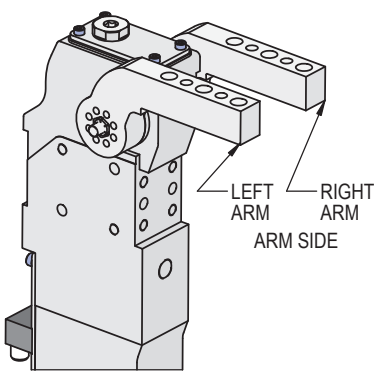
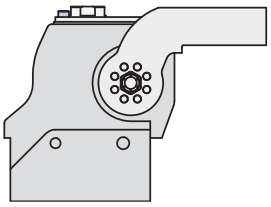
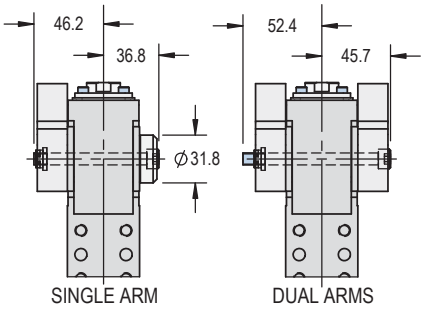


5.2 - TPCA-52





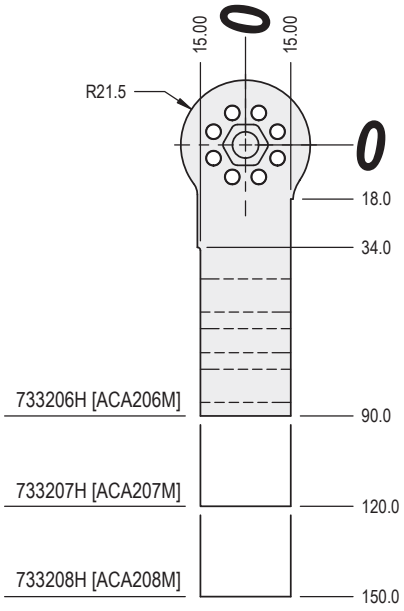


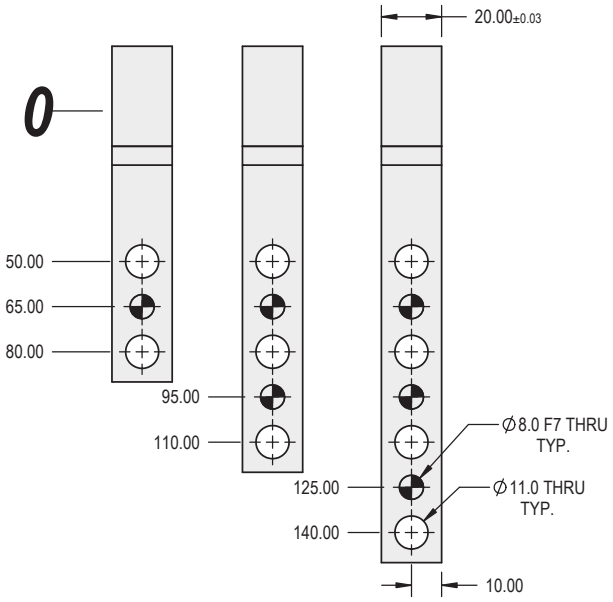


ARM MOUNTING WITH HARDWARE

5.2.1 - TPCA-52 ARMS

STRAIGHT ARM





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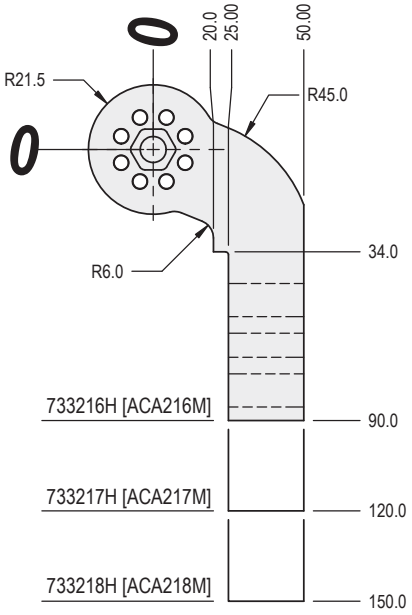

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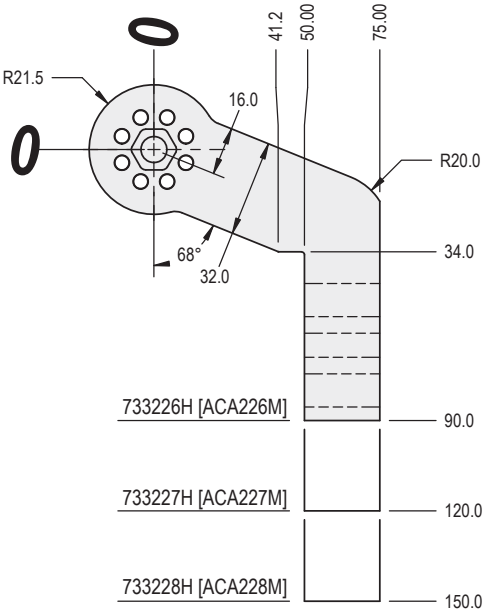
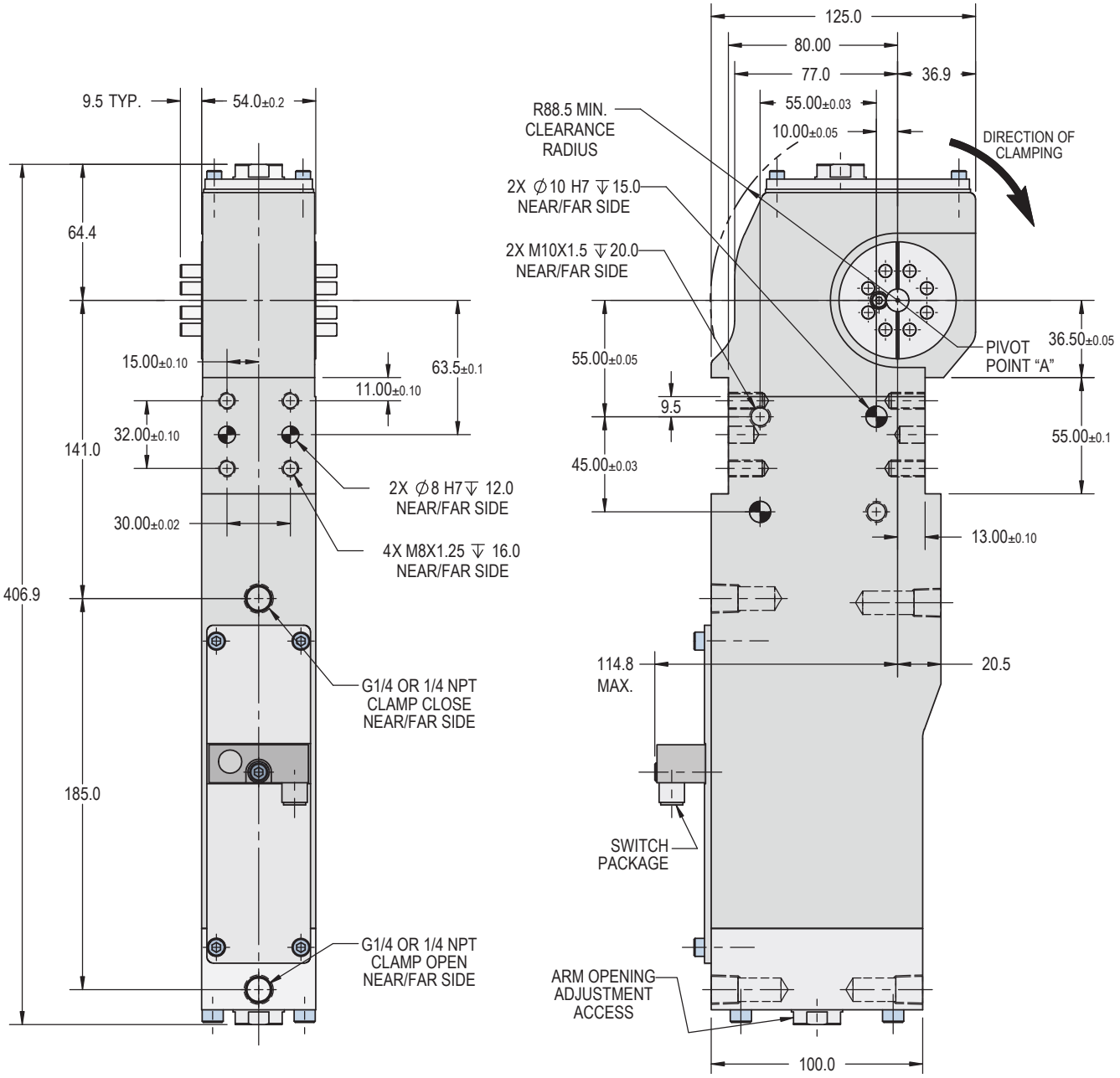
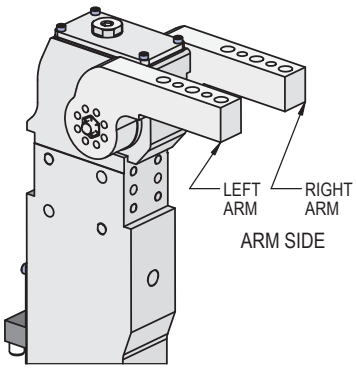
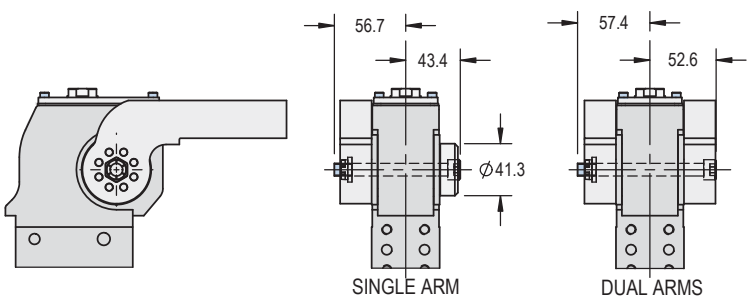


5.3 - TPCA-62



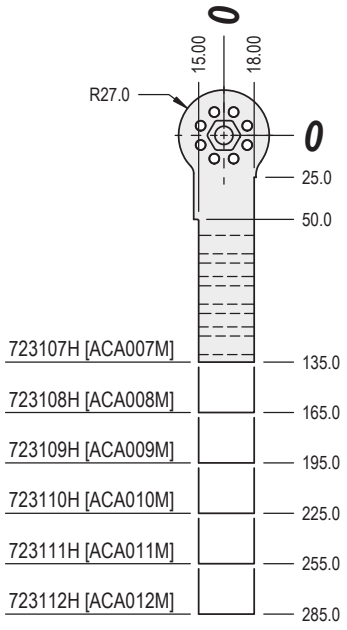


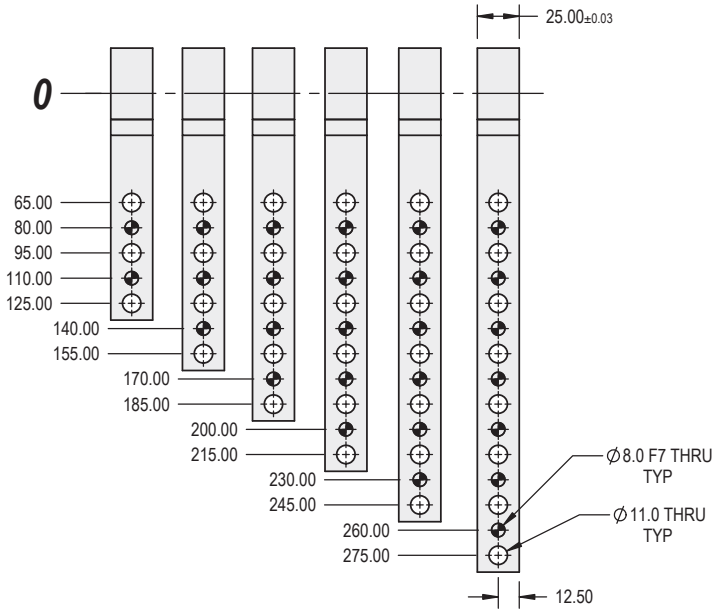


ARM MOUNTING WITH HARDWARE

5.3.1 - TPCA-62 ARMS

STRAIGHT ARM





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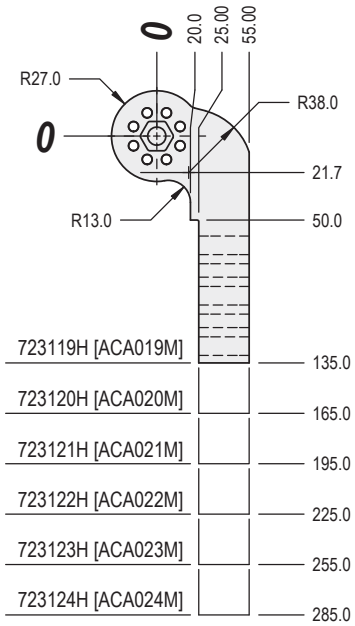

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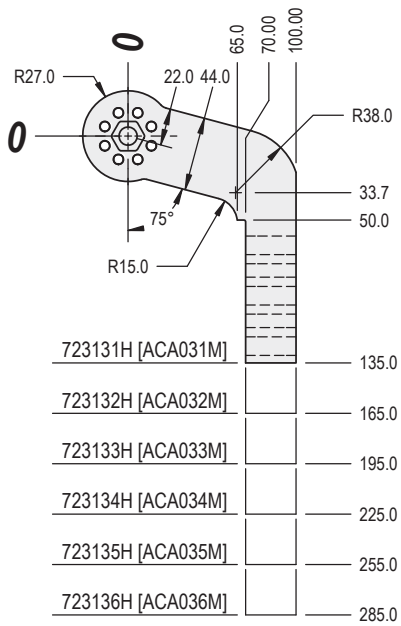

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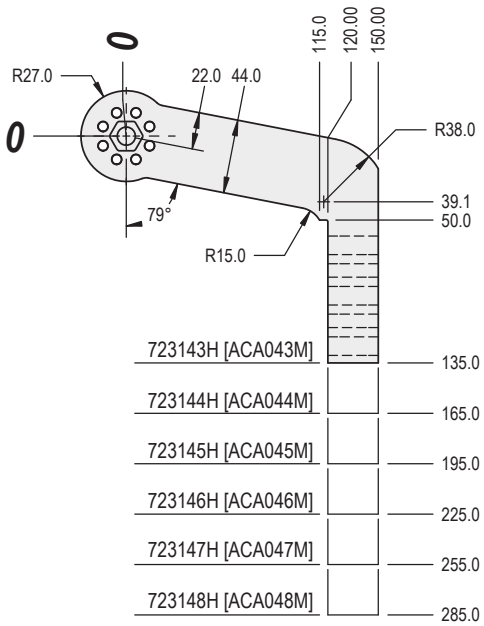
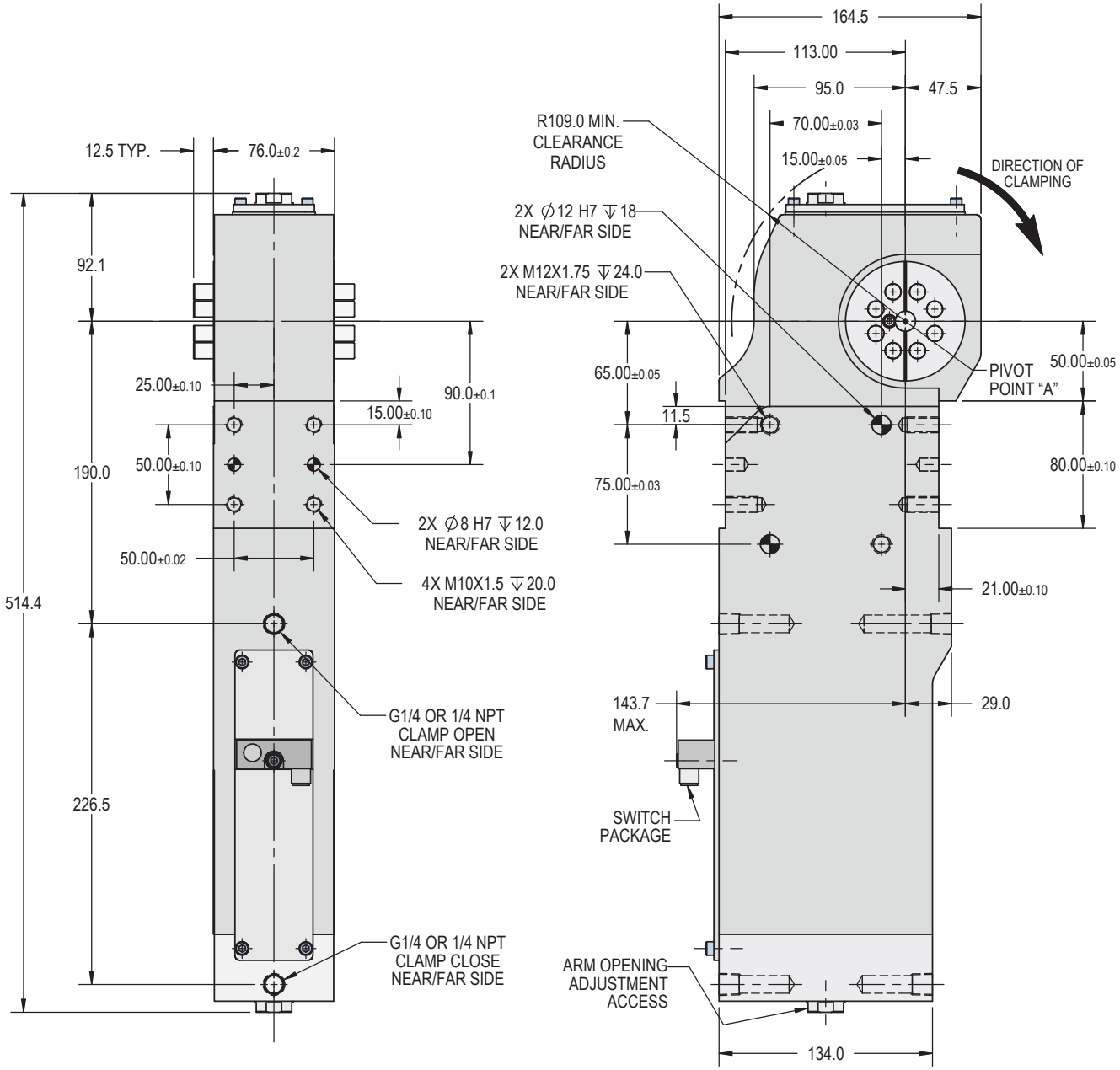
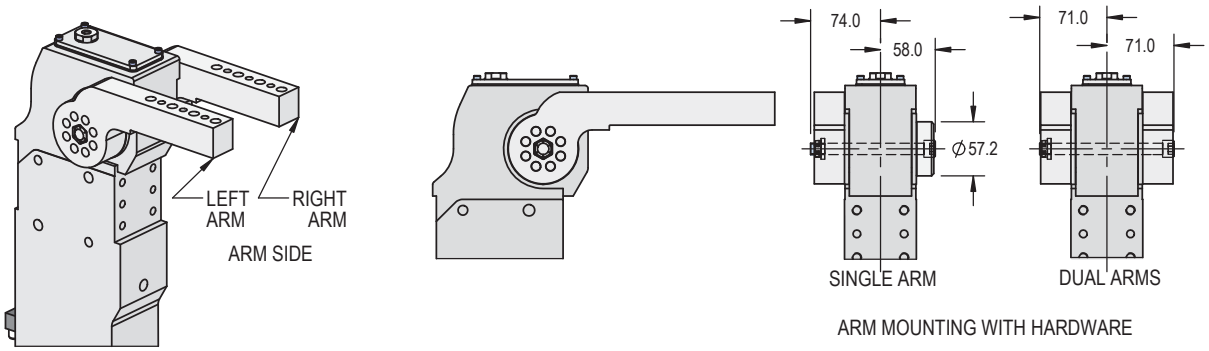


5.4 - TPCA-82

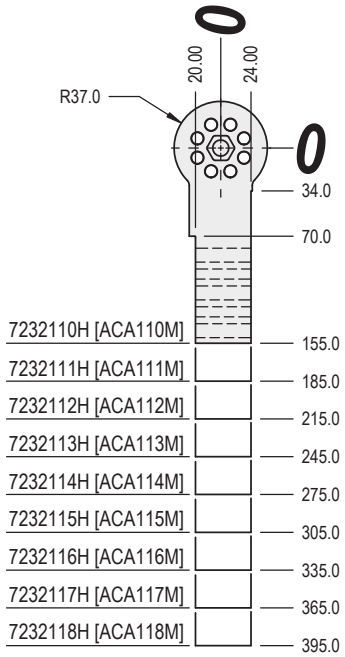


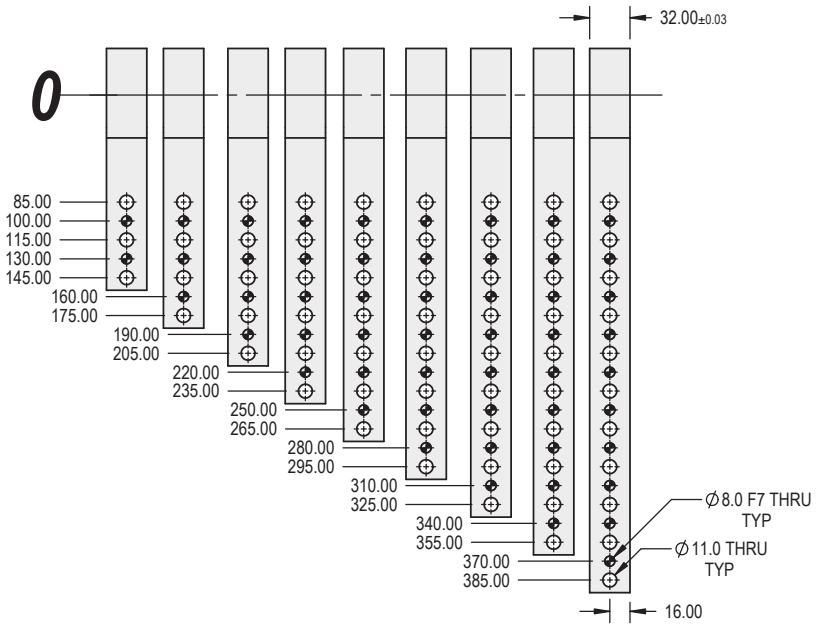


ARM MOUNTING WITH HARDWARE

5.4.1 - TPCA-82 ARMS

STRAIGHT ARM





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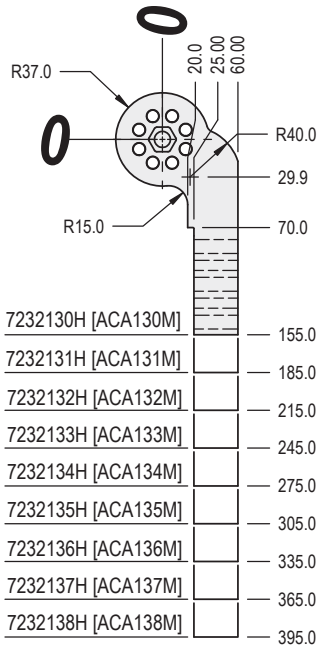

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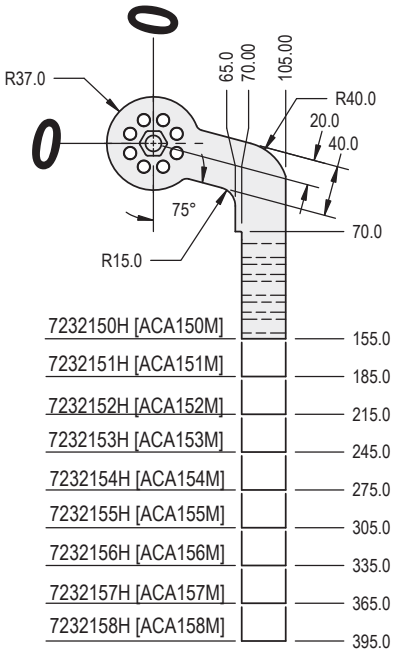

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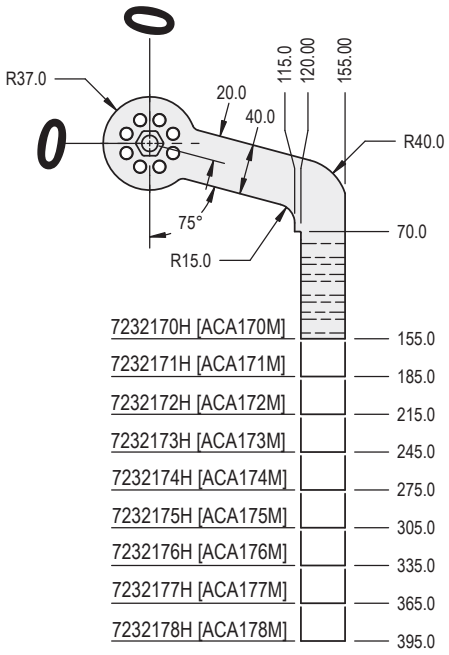


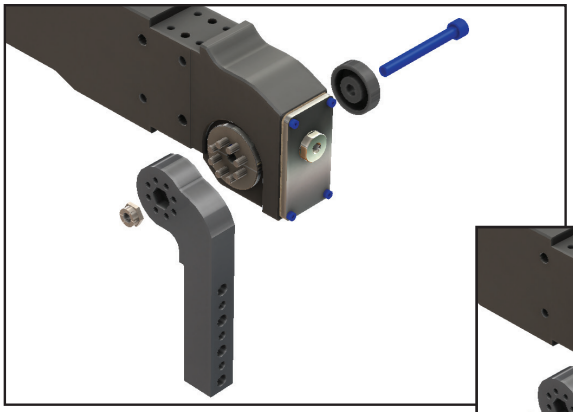
6.0 - CLAMP ARM INFORMATION

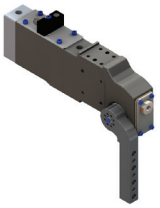
6.1 - WELDING ON CLAMP ARMS

Remove the clamp arm before welding on it, or attach the ground cable directly to the arm so as not to pass current through the bearings of the clamp mechanism. ***Damage to the clamp mechanism as a result of welding on the arm will not be warranted.***

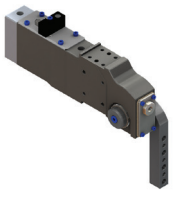
6.2 - ARM MOUNTING FEATURES

The BTM TPCA clamp features a patented pin drive hub which simplifies arm changes and provides quick and easy positioning of the arm on either side of the clamp. Simply install the arm on one side of the clamp, and the cap on the other side, or install two arms on the same clamp. The (8) pins allow for easy positioning of the arm at 45^0 increments. The machined surface of the arm may be turned to face either way ("A" or "B" position).

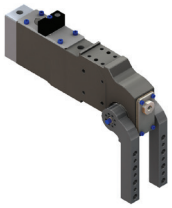




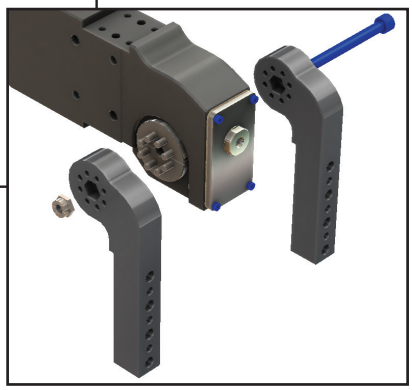
Left Arm Position

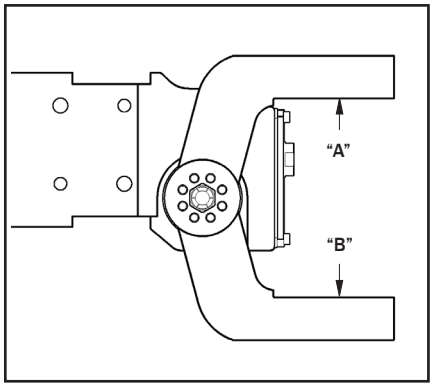


Right Arm Position



Dual Position





ARM SCREW TORQUE

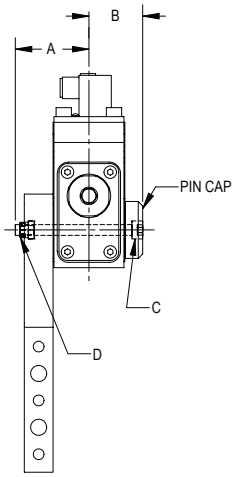
TPCA42 = [M6 Screw] 9.5 Nm [7 lb-ft]
TPCA52 = [M8 Screw] 23 Nm [17 lb-ft]
TPCA62 = [M10 Screw] 45 Nm [33 lb-ft]
TPCA82 = [M12 Screw] 79 Nm [58 lb-ft]

6.3 - TPCA ARM MOUNT KITS

These kits are automatically applied to your clamp order when you specify your arm configuration in the order code. For reference only.

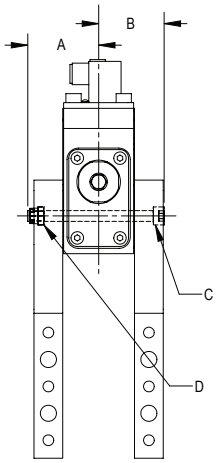
SINGLE ARM MOUNT KIT

Includes Arm Screw, Nut & Pin Cap.



DUAL ARM MOUNT KIT

Includes Arm Screw and Nut.

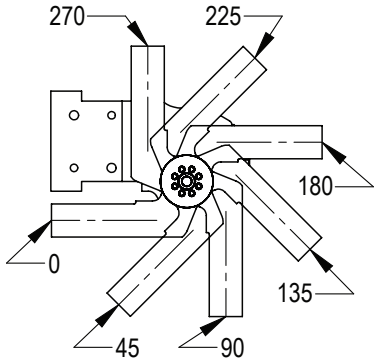


ARM MOUNT KITS - PIN HUB						
Clamp	Arm Kit	A	B	C	D	Pin Cap
TPCA42	Single Arm	41.0	30.0	SHCS: M6x1.0 X 65	M6 Flex-Loc Nut	799305A
	Dual Arm	46.0	36.0	SHCS: M6x1.0 X 70	M6 Flex-Loc Nut	—
TPCA52	Single Arm	46.2	36.8	SHCS: M8X1.25 X 75	M8 Flex-Loc Nut Thin Ht.	795505A
	Dual Arm	52.4	45.7	SHCS: M8X1.25 X 90	M8 Flex-Loc Nut Thin Ht.	—
TPCA62	Single Arm	56.7	43.4	SHCS: M10X1.5 X 90	M10 Flex-Loc Nut Thin Ht.	795605A
	Dual Arm	57.4	52.6	SHCS: M10X1.5 X 100	M10 Flex-Loc Nut Thin Ht.	—
TPCA82	Single Arm	74.0	58.0	SHCS: M12X1.75 X 120	M12 Flex-Loc Nut Thin Ht.	795705A
	Dual Arm	71.0	71.0	SHCS: M12X1.75 X 130	M12 Flex-Loc Nut Thin Ht.	—

6.4 - ARM MOUNTING OPTIONS

All clamps are shown in the closed position. The maximum counter-clockwise arm opening value is noted in degrees for the specified arm positions.

Arm positions which interfere with the clamp body in either the close or open positions are not shown.



TPCA42

STANDARD ARM ORIENTATION (A)				INVERTED ARM ORIENTATION (B)			
Arm Mounting Position Code	Offset Arm			Arm Mounting Position Code	Offset Arm		
	Straight	15	45		Straight	15	45
0	N/A	120°	120°	0	N/A	N/A	N/A
45	120°	120°	120°	45	120°	N/A	N/A
90	120°	120°	120°	90	120°	120°	120°
135	120°	120°	90°	135	120°	120°	120°
180	105°	90°	45°	180	120°	120°	120°
225	60°	45°	N/A	225	75°	90°	120°
270	N/A	N/A	N/A	270	30°	45°	75°

TPCA52

STANDARD ARM ORIENTATION (A)				INVERTED ARM ORIENTATION (B)			
Arm Mounting Position Code	Offset Arm			Arm Mounting Position Code	Offset Arm		
	Straight	25	50		Straight	25	50
0	N/A	120°	120°	0	N/A	N/A	N/A
45	N/A	120°	120°	45	N/A	N/A	N/A
90	120°	120°	120°	90	120°	N/A	N/A
135	120°	90°	75°	135	120°	120°	120°
180	90°	45°	30°	180	90°	120°	120°
225	45°	N/A	N/A	225	45°	90°	105°
270	N/A	N/A	N/A	270	N/A	45°	60°

TPCA62

STANDARD ARM ORIENTATION (A)					INVERTED ARM ORIENTATION (B)				
Arm Mounting Position Code	Offset Arm				Arm Mounting Position Code	Offset Arm			
	Straight	25	70	120		Straight	25	70	120
0	N/A	120°	120°	120°	0	N/A	N/A	N/A	N/A
45	120°	120°	120°	120°	45	120°	N/A	N/A	N/A
90	120°	120°	120°	105°	90	120°	N/A	N/A	N/A
135	120°	90°	75°	60°	135	120°	120°	120°	120°
180	105°	45°	30°	N/A	180	105°	120°	120°	120°
225	60°	N/A	N/A	N/A	225	60°	75°	105°	120°
270	N/A	N/A	N/A	N/A	270	N/A	30°	60°	90°

TPCA82

STANDARD ARM ORIENTATION (A)					INVERTED ARM ORIENTATION (B)				
Arm Mounting Position Code	Offset Arm				Arm Mounting Position Code	Offset Arm			
	Straight	25	70	120		Straight	25	70	120
0	N/A	N/A	120°	120°	0	N/A	N/A	N/A	N/A
45	120°	120°	120°	120°	45	120°	N/A	N/A	N/A
90	120°	120°	120°	120°	90	120°	N/A	N/A	N/A
135	120°	105°	75°	75°	135	120°	120°	120°	120°
180	90°	60°	30°	30°	180	90°	120°	120°	120°
225	60°	N/A	N/A	N/A	225	60°	75°	105°	120°
270	N/A	N/A	N/A	N/A	270	N/A	30°	60°	75°

6.5 - CHANGING THE ARM DEGREE OF OPENING

TPCA clamps are normally shipped unlocked with the degree of opening set to the customer's specifications.
Note: if the specified arm position does not allow this degree of opening, the clamp arm will be shipped loose.

YOU WILL NEED:

- **8mm Hex Key**

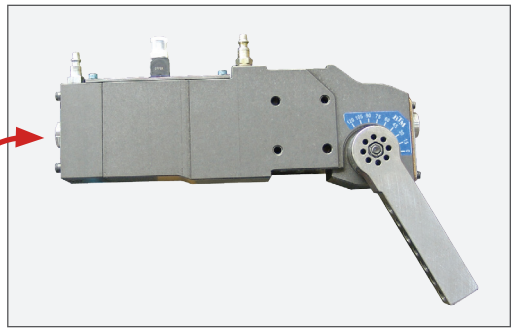
TO CHANGE THE DEGREE OF ARM OPENING ON A TPCA CLAMP

Make sure the clamp is in the **full open position**, then disconnect all air and electrical supply lines to the clamp.

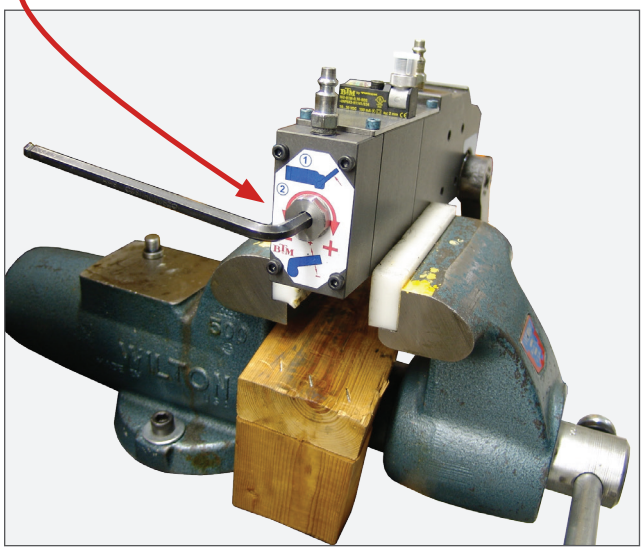
CAUTION!

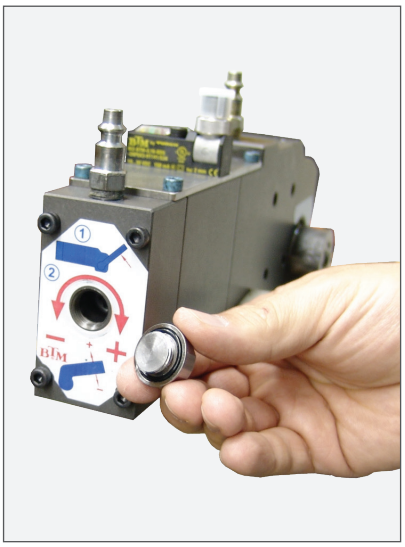
Always disconnect air and electrical supply lines before working on or around power clamps!

Once the clamp is in the open position, and ***all air and electrical supply lines have been disconnected***, remove the protection plug from the end of the clamp with an 8mm hex key.



The protection plug is located at the end of the clamp.





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6.5 - CHANGING THE ARM DEGREE OF OPENING (CONTINUED)

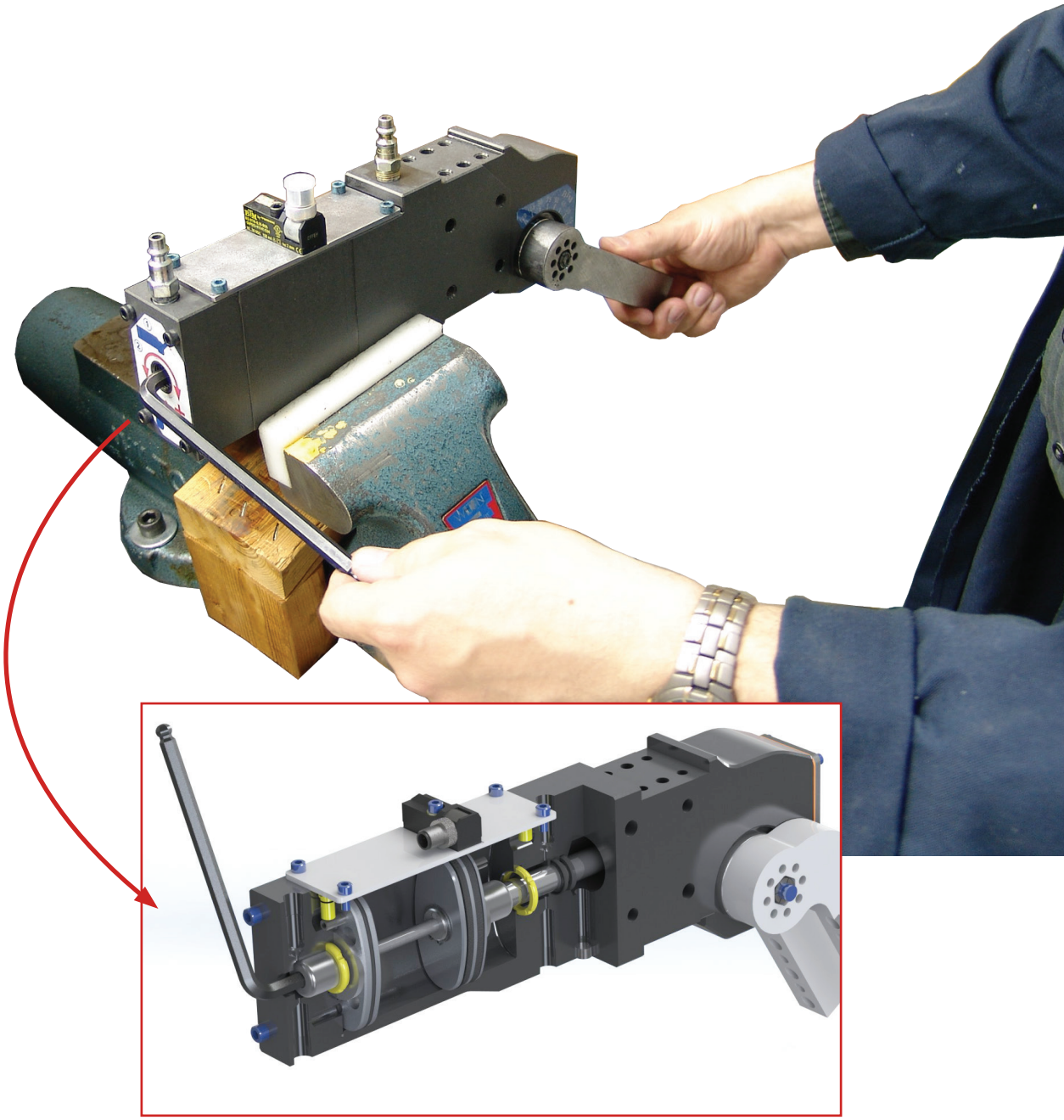
After the protection plug has been removed, use the same allen wrench to change the degree of arm opening.

Turn the allen wrench counter-clockwise to decrease the amount of arm opening, and turn it clockwise to increase the amount of arm opening. There is a sticker on the back of the clamp which illustrates this for your convenience.

Note: You may need to pull slightly on the arm while you adjust the opening.

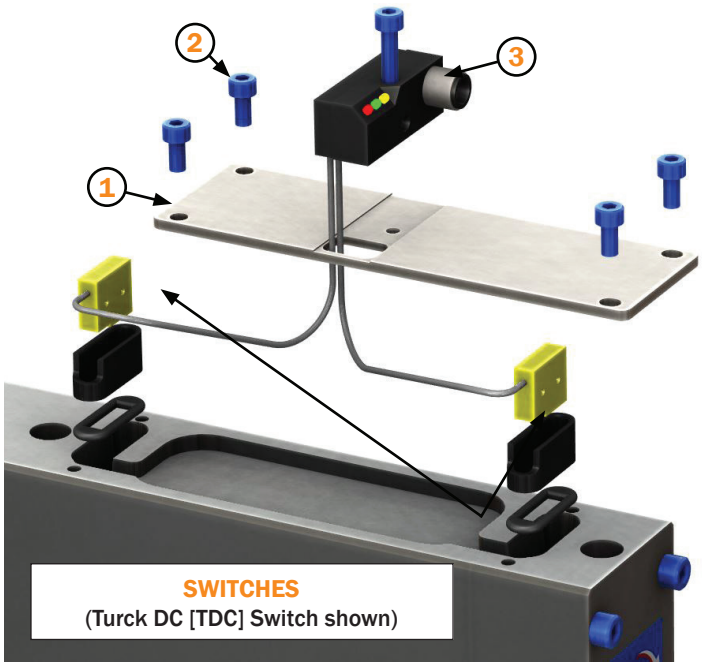
Once you have obtained the desired arm opening, remove the allen wrench and replace the protection plug.

No readjustment of the proximity switch is required.



7.0 - STATUS CONTROLLER SWITCH OPTIONS

Status controller switch options are shown below. To replace a status controller switch, disconnect the air pressure to the clamp. Remove the four switch plate screws (2) and the screw which retains the status controller body (3). Lift up the switch plate (1) and carefully lift out the switches, removing them from the clamp body. Insert the switches of the replacement status controller through the clearance hole in the switch plate. Insert the switches into the recesses in the clamp body. Replace the switch plate (1), making sure that the lead wires are positioned in the machined grooves so they are not pinched between the plate and the clamp body. Tighten all the screws *(note the torque values on the diagram below)*. Visually check the clamp to ensure that it was reassembled correctly.



SWITCHES
(Turck DC [TDC] Switch shown)

TORQUE INFO:

M5 Screw = 8.8 Nm (6.5 lb-ft)

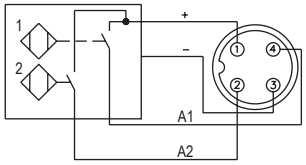
NOTE REGARDING SWITCHES

Turck chicklet switches [TDC] are standard on TPCA52, 62, & 82. Turck BDC Switch is only available on TPCA42. Optional switches may be available upon request (including Turck AC [TAC for TPCA52, 62, & 82] or [BAC for TPCA42]) Contact BTM for price and delivery information.

TPCA42 BDC Switch Example

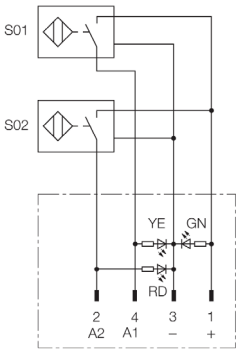
STANDARD SWITCH OPTION FOR TPCA52, TPCA62, TPCA82 [TDC]

DET.	QTY.	DESCRIPTION	TPCA52	TPCA62	TPCA82
Complete Assembly BTM Numbers:			780400A	780300A	780500A
A COMPLETE ASSEMBLY CONTAINS:					
1	1	Switch Cover Plate	780401A	780301A	780501A
2	4	M5 x 10 LG. S.H.C.S.	018490		
3	1	Prox Switch	TURCK DC SWITCH [TDC]		
			BTM No. 018426		



STANDARD SWITCH OPTION: TPCA42 [BDC]

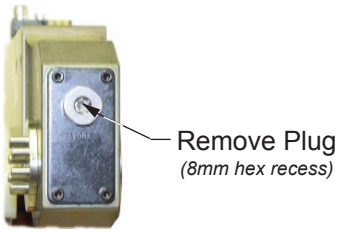
DET.	QTY.	DESCRIPTION	TPCA42
Complete Assembly BTM Number:			PD253300SCDC
A COMPLETE ASSEMBLY CONTAINS:			
1	1	Switch Cover Plate	PD253301SCDC
2	4	M5 x 10 LG. S.H.C.S.	018490
3	1	Prox Switch	Turck DC [BDC]
			BTM No. 024216

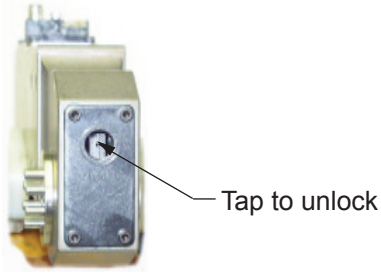


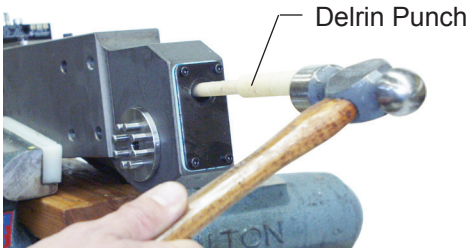
8.0 - MAINTENANCE

8.1 - MANUALLY UNLOCKING THE TPCA CLAMP

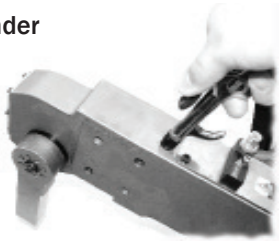
To unlock the TPCA clamp, make sure that the air supply is disconnected. Remove the front cover plug and and tap the linkage with a delrin punch to unlock the mechanism. Apply blue loctite to the threads of the plug. Replace the plug and tighten to 34 Nm (25 lb-ft).







The TPCA clamp can also be unlocked by applying air pressure to the rod side of the cylinder with a rubber tipped nozzle.



CAUTION! *- Stay Clear of Clamp Arm!*

8.2 - PREVENTATIVE MAINTENANCE

BTM TPCA model power clamps are lubricated for life at the factory.
The cylinder seals are self lubricating and do not require in line air lubrication.

8.3 - AIR SUPPLY

BTM TPCA model power clamps are designed to operate on 2.75 to 7 bars (40 to 100 psi) of clean, lubricated or non-lubricated air. ***Note: Once lubricated air is used, it must continue to be used for the life of the clamp.***

TPCA42 SCFM = 1.1 SCFM	TPCA52 SCFM = 2.2 SCFM	TPCA62 SCFM = 4.5 SCFM	TPCA62 SCFM = 9.2 SCFM

8.4 - USE OF FLOW CONTROLS

TPCA model clamps have built in, non-adjustable, cylinder cushions. Flow control valves are not required if the weight of the clamp arm assembly falls within the charted specifications on page 5. Flow control valves may be added per customer preference or specification to reduce slamming of the clamp arm. Flow controls should be adjusted to achieve the required cycle rate, not exceeding the maximum rate of 1 second to open and 1 second to close for a 120^{o} opening clamp. Cycling the clamp faster than the maximum rate may result in premature failure and will void the warranty. If additional control is required for sequencing of multiple clamps, flow control valves can be added to adjust the cycle rate.

8.5 - FIXED ORIFICES

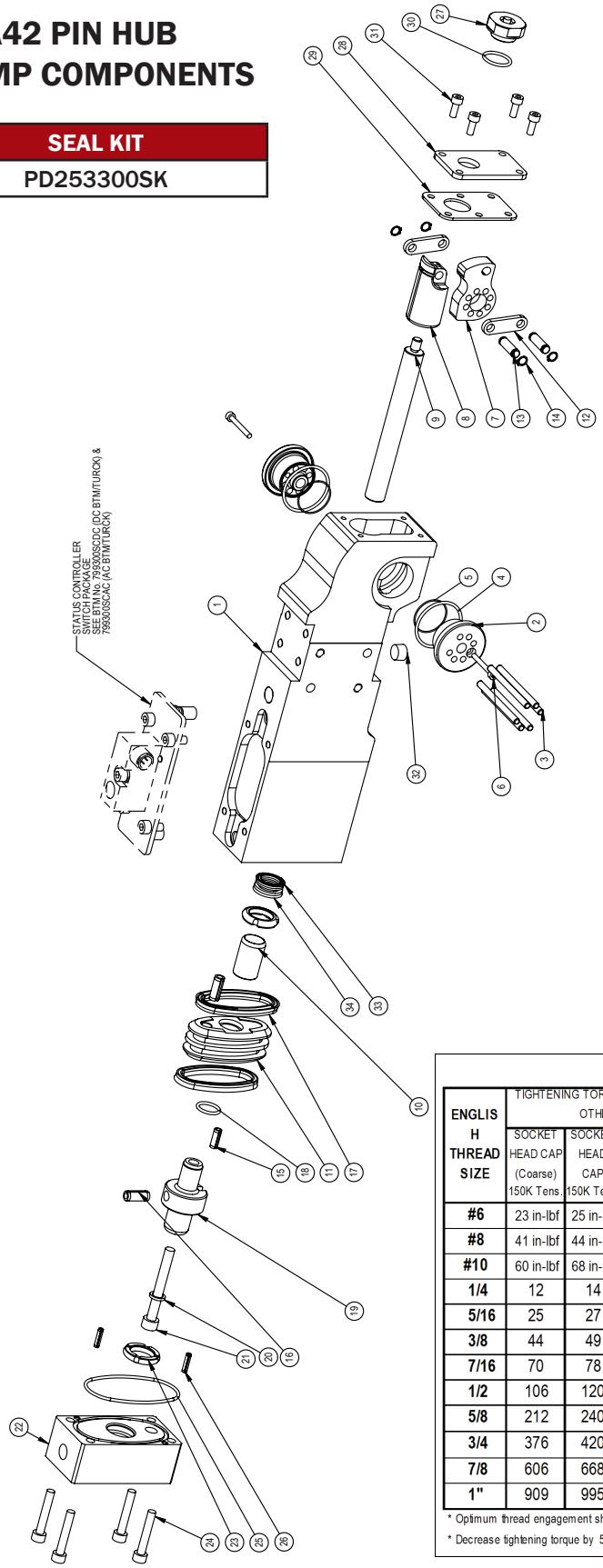
TPCA model power clamps employ fixed orifices which are machined into the ports in both the end cap and in the clamp body. These orifices are intended to protect the clamp from operating in excess of the recommended cycle rate relative to the mass of the arm. **Note: Enlarging the clamps integral fixed orifices will void the warranty.**

8.6 - ORDERING SPARE PARTS

Due to the conditions of the clamp warranty, the unit is generally exchanged or repaired at the factory. If spare parts are required, contact BTM or a BTM Authorized Distributor. See the following page for a comprehensive list of TPCA clamp components. BTM recommends stocking proximity switches, hub o-rings, unlock plugs, arm mounting pins, bolts, and flex-loc nuts.

TPCA42 PIN HUB CLAMP COMPONENTS

SEAL KIT
PD253300SK



Torque Chart - English & Metric Rev 3 (27 May 2005)

ENGLISH THREAD SIZE	TIGHTENING TORQUE [ft-lbf] REQUIRED (UNLESS OTHERWISE SPECIFIED)						METRIC THREAD SIZE	TIGHTENING TORQUE [ft-lbf] REQUIRED (UNLESS OTHERWISE SPECIFIED)				
	SOCKET HEAD CAP (Coarse) 150K Tens.	SOCKET HEAD CAP 150K Tens	LOW HEAD CAP 150K Tens.	HEX HEAD Grade 5	SET SCREWS Alloy Steel	SHOULDER SCREWS 160K Tens.		SOCKET HEAD CAP Grade 12.9	LOW HEAD CAP Grade 10.9	HEX HEAD Grade 10.9	SET SCREWS Alloy Steel	SHOULDE RSCREWS 160K Tens.
#6	23 in-lbf	25 in-lbf	---	---	10 in-lbf	---	M4	39 in-lbf	40 in-lbf	32 in-lbf	19 in-lbf	---
#8	41 in-lbf	44 in-lbf	25 in-lbf	---	20 in-lbf	---	M5	78 in-lbf	75 in-lbf	64 in-lbf	35 in-lbf	60 in-lbf
#10	60 in-lbf	68 in-lbf	35 in-lbf	---	36 in-lbf	---	M6	11	10	12	64 in-lbf	9
1/4	12	14	80 in-lbf	9	87 in-lbf	9	M8	27	25	29	12	19
5/16	25	27	13	19	13	19	M10	53	51	57	24	42
3/8	44	49	23	34	24	32	M12	93	88	100	40	74
7/16	70	78	---	---	35	---	M16	230	220	247	99	177
1/2	106	120	55	84	51	83	M20	450	425	480	175	347
5/8	212	240	---	167	110	165	M24	777	---	834	321	---
3/4	376	420	---	296	200	291	M30	1545	---	1653	---	---
7/8	606	668	---	400	300	468						
1"	909	995	---	718	416	---						

* 1 ft-lbf = 1.356 N-m

* Optimum thread engagement should be approximately 1.5 times the bolt diameter for steel and 2.0 times for aluminum
* Decrease tightening torque by 50% when using bolt in non-heat treated aluminum

TPCA42 PIN HUB CLAMP COMPONENTS

DET.	QTY.	DESCRIPTION	BTM NO.
1	1	TPCA42: BODY	CHART "A"
2	1	TPCA42: END CAP	CHART "A"
3	1	TPCA42: PISTON	PD253303A
4	1	TPCA42: PISTON ROD	PD253304A
5	1	TPCA42: FRONT ADJUSTABLE CUSHION	PD253305A
6	1	TPCA42: REAR ADJUSTABLE CUSHION	PD253306A
7	1	TPCA52: THREADED ADJUST ROD	PD250508A
8	1	TPCA52: ADJUSTING SHIM	PD250509A
9	2	TPC42: PIN HUB	799303A
10	6	TPC42: ARM MOUNT PIN	799306A
11	1	TPC42: SLIDE BLOCK	799310A
12	2	TPC42: LINK	799311A
13	1	TPC42: DRIVE ARM - SPLIT HUB	799312A
14	2	TPC42: LINK PIN	799313A
15	1	STC52AWEC: ANTI-ROTATE PLUG	776204A
16	2	UPCP - UNLOCK PLUG	772601A
17	1	MUCP52: FRONT COVER	741701A
18	1	TPC42: FRONT COVER GASKET- CORK/BUNA-N	799301J
19	1	PARKER U-CUP PACKING	018085
20	2	POLYPAK SEAL	028853
21	1	POLYSEAL: SQB	019186
22	2	PARKER V6 CUSHION SEAL	018092
23	2	URETHANE O-RING	038179
24	2	O-RING: .866 ID x .030	036944
25	1	SEAL: O-RING, 2-032 N674-70	006182
26	1	O-RING	004769
27	2	O-RING	001417
28	4	EXTERNAL RETAINING RING	036942
29	1	EXTERNAL RETAINING RING	027576
30	1	1/8 NPT LEVL-SEAL PIPE PLUG	014269
31	1	1/4 DIA. x 3/4 LG. ROLL PIN	001058
32	2	1/8 DIA. x 1/2 LG. ROLL PIN	016350
33	4	SHCS: M5X0.8 X 35	018491
34	4	SHCS: M4X0.7 X 10	018371
35	1	SHCS: M5X0.8 X 8	018489
36	2	SHCS: M3X0.5 X 25	017266
37	1	TPCA42 END CAP ADJ. STICKER	PD253351A
38	1	TPCA42 OPEN ANGLE STICKER	PD253350A

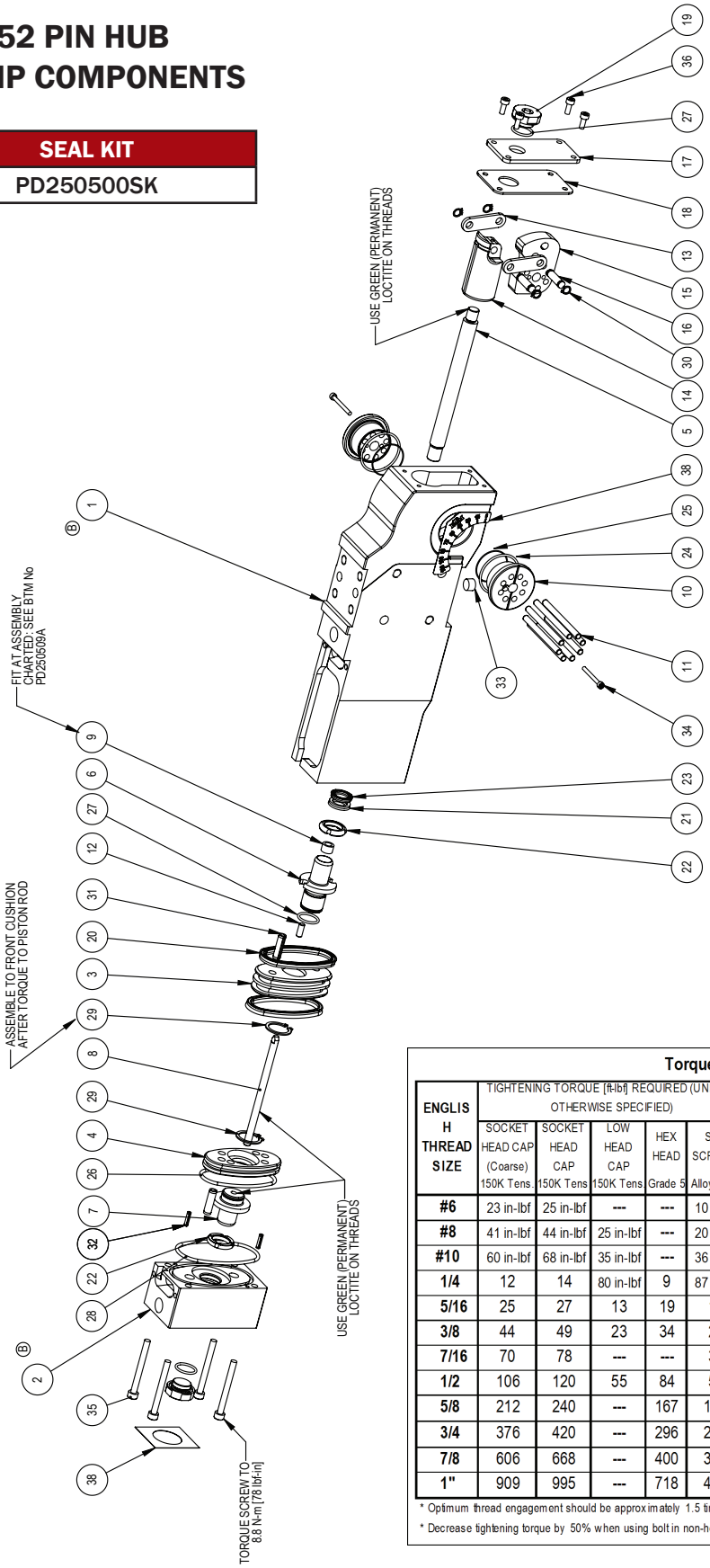
CHART "A"

1.) CLAMP BODY	
BTM No.	Description
PD253301A	TPCA42: BODY 1/8 NPT
PD253501A	TPCA42: BODY G1/8

2.) END CAP	
BTM No.	Description
PD253302A	TPCA42: END CAP 1/8 NPT
PD253502A	TPCA42: END CAP G1/8

TPCA52 PIN HUB CLAMP COMPONENTS

SEAL KIT
PD250500SK



Torque Chart - English & Metric Rev 3 (27 May 2005)

ENGLISH THREAD SIZE	TIGHTENING TORQUE [ft-lbf] REQUIRED (UNLESS OTHERWISE SPECIFIED) SOCKET HEAD CAP (Coarse) 150K Tens.	SOCKET HEAD CAP 150K Tens	LOW HEAD CAP 150K Tens.	HEX HEAD Grade 5	SET SCREWS Alloy Steel	SHOULDER SCREWS 160K Tens.	METRIC THREAD SIZE	TIGHTENING TORQUE [ft-lbf] REQUIRED (UNLESS OTHERWISE SPECIFIED) SOCKET HEAD CAP Grade 12.9	LOW HEAD CAP Grade 10.9	HEX HEAD Grade 10.9	SET SCREWS Alloy Steel	SHOULDER SCREWS 160K Tens.
#6	23 in-lbf	25 in-lbf	---	---	10 in-lbf	---	M4	39 in-lbf	40 in-lbf	32 in-lbf	19 in-lbf	---
#8	41 in-lbf	44 in-lbf	25 in-lbf	---	20 in-lbf	---	M5	78 in-lbf	75 in-lbf	64 in-lbf	35 in-lbf	60 in-lbf
#10	60 in-lbf	68 in-lbf	35 in-lbf	---	36 in-lbf	---	M6	11	10	12	64 in-lbf	9
1/4	12	14	80 in-lbf	9	87 in-lbf	9	M8	27	25	29	12	19
5/16	25	27	13	19	13	19	M10	53	51	57	24	42
3/8	44	49	23	34	24	32	M12	93	88	100	40	74
7/16	70	78	---	---	35	---	M16	230	220	247	99	177
1/2	106	120	55	84	51	83	M20	450	425	480	175	347
5/8	212	240	---	167	110	165	M24	777	---	834	321	---
3/4	376	420	---	296	200	291	M30	1545	---	1653	---	---
7/8	606	668	---	400	300	468						
1"	909	995	---	718	416	---						

* 1 ft-lbf = 1.356 N-m

* Optimum thread engagement should be approximately 1.5 times the bolt diameter for steel and 2.0 times for aluminum

* Decrease tightening torque by 50% when using bolt in non-heat treated aluminum

TPCA52 PIN HUB CLAMP COMPONENTS

DET.	QTY.	DESCRIPTION	BTM NO.
1	1	TPCA52: BODY - CHICKLET SWITCH	CHART "B"
2	1	TPCA52: END CAP - CHICKLET SWITCH	CHART "B"
3	1	TPCA52: PISTON	PD250503A
4	1	TPCA52: ADJUSTING GUIDE	PD250504A
5	1	TPCA52: PISTON ROD	PD250505A
6	1	TPCA52: FRONT ADJUSTABLE CUSHION	PD250506A
7	1	TPCA52: REAR ADJUSTABLE CUSHION	PD250507A
8	1	TPCA52: THREADED ADJUST ROD	PD250508A
9	1	TPC52A: ADJUSTING SHIM	CONTACT BTM
10	2	TPC52: PIN HUB	795503A
11	8	TPC52: ARM MOUNT PIN	795506A
12	1	STC52AWEC: ANTI-ROTATE PLUG	776204A
13	2	TPC52: LINK	795509A
14	1	TPC52: SLIDE BLOCK	795507A
15	1	TPC52: DRIVE ARM	795508A
16	2	TPC52: LINK PIN	795510A
17	1	MUCP62: FRONT COVER	737003A
18	1	TPC52: FRONT COVER GASKET- CORK/BUNA-N	795501J
19	2	UPCP - UNLOCK PLUG	772601A
20	2	POLYPAK SEAL	019127
21	1	PARKER U-CUP PACKING	018085
22	2	PARKER V6 CUSHION SEAL	018092
23	1	POLYSEAL: SQB	019186
24	2	URETHANE O-RING	018694
25	2	O-RING: 1.134 ID x .030	033939
26	1	O-RING: 2-137 N674-70	000308
27	3	O-RING	001417
28	1	O-RING	018666
29	2	EXTERNAL RETAINING RING	000997
30	4	EXTERNAL RETAINING RING	001237
31	2	PIN: ROLL 1/4 DIA X 7/8	044772
32	2	1/8 DIA. x 1/2 LG. ROLL PIN	016350
33	1	1/8 NPT LEVL-SEAL PIPE PLUG	014269
34	2	SHCS: M3X0.5 X 30	018471
35	4	SHCS: M5X0.8 X 50	018494
36	4	SHCS: M4X0.7 X 10	018371
37	1	TPCA52 OPEN ANGLE STICKER	PD250550A
38	1	TPCA42 END CAP ADJ. STICKER	PD253351A

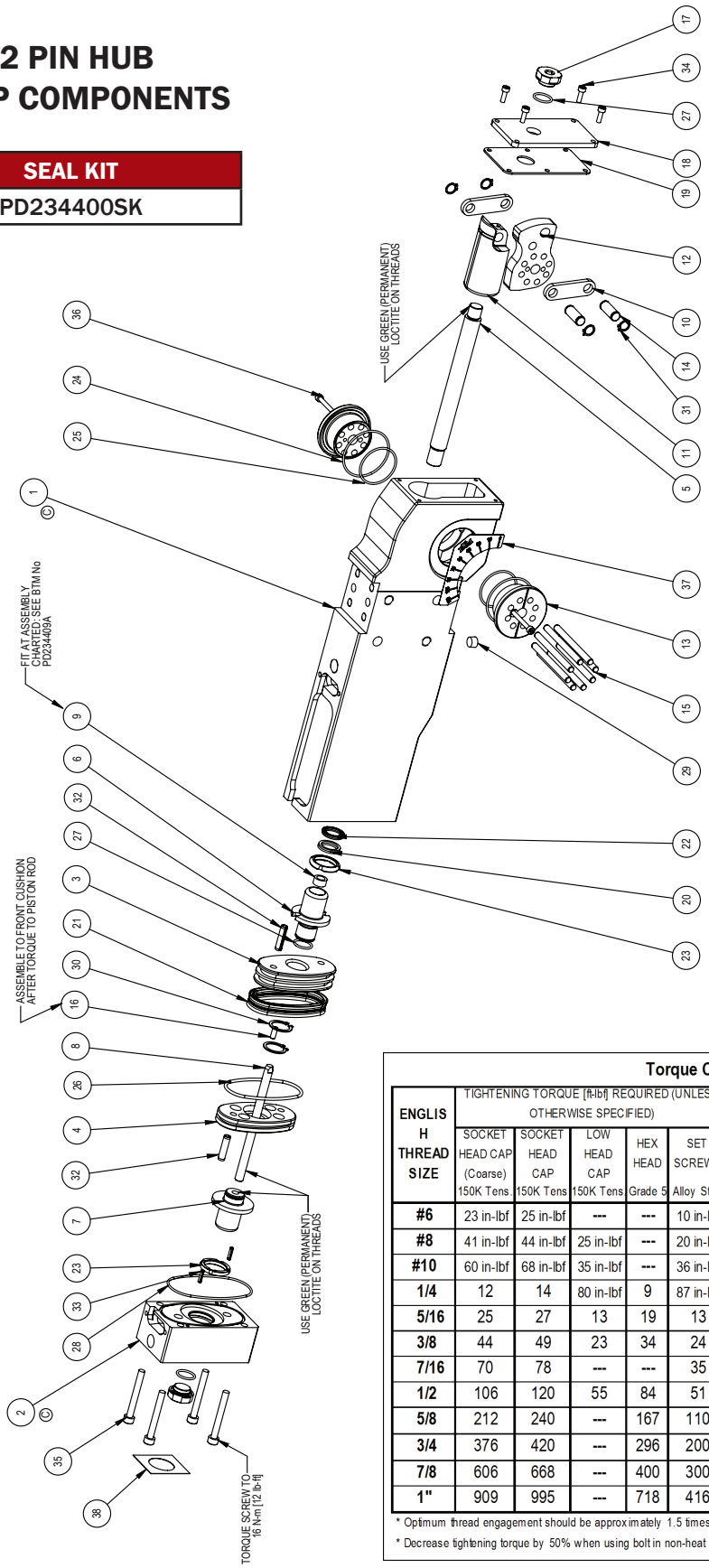
CHART "B"

1.) CLAMP BODY - CHICKLET SWITCH	
BTM No.	Description
PD250552A	TPCA52: BODY 1/4 NPT CHICKLET SWITCH
PD251303A	TPCA52: BODY G1/4 CHICKLET SWITCH

2.) END CAP - CHICKLET SWITCH	
BTM No.	Description
PD250553A	TPCA52: END CAP 1/4 NPT CHICKLET SWITCH
PD251304A	TPCA52: END CAP G1/4 CHICKLET SWITCH

TPCA62 PIN HUB CLAMP COMPONENTS

SEAL KIT
PD234400SK


USE GREEN (PERMANENT) LOCTITE ON THREADS
FIT AT ASSEMBLY CHARTED; SEE BTM No PD234409A
ASSEMBLE TO FRONT CUSHION AFTER TORQUE TO PISTON ROD
USE GREEN (PERMANENT) LOCTITE ON THREADS
TORQUE SCREW TO 16 N-m [12 lb-ft]

Torque Chart - English & Metric Rev 3 (27 May 2005)

ENGLISH THREAD SIZE	TIGHTENING TORQUE [ft-lbf] REQUIRED (UNLESS OTHERWISE SPECIFIED)						METRIC THREAD SIZE	TIGHTENING TORQUE [ft-lbf] REQUIRED (UNLESS OTHERWISE SPECIFIED)				
	SOCKET HEAD CAP (Coarse) 150K Tens.	SOCKET HEAD CAP 150K Tens	LOW HEAD CAP 150K Tens	HEX HEAD Grade 5	SET SCREWS Alloy Steel	SHOULDER SCREWS 160K Tens.		SOCKET HEAD CAP Grade 12.9	LOW HEAD CAP Grade 10.9	HEX HEAD Grade 10.9	SET SCREWS Alloy Steel	SHOULDERSCREWS 160K Tens.
#6	23 in-lbf	25 in-lbf	---	---	10 in-lbf	---	M4	39 in-lbf	40 in-lbf	32 in-lbf	19 in-lbf	---
#8	41 in-lbf	44 in-lbf	25 in-lbf	---	20 in-lbf	---	M5	78 in-lbf	75 in-lbf	64 in-lbf	35 in-lbf	60 in-lbf
#10	60 in-lbf	68 in-lbf	35 in-lbf	---	36 in-lbf	---	M6	11	10	12	64 in-lbf	9
1/4	12	14	80 in-lbf	9	87 in-lbf	9	M8	27	25	29	12	19
5/16	25	27	13	19	13	19	M10	53	51	57	24	42
3/8	44	49	23	34	24	32	M12	93	88	100	40	74
7/16	70	78	---	---	35	---	M16	230	220	247	99	177
1/2	106	120	55	84	51	83	M20	450	425	480	175	347
5/8	212	240	---	167	110	165	M24	777	---	834	321	---
3/4	376	420	---	296	200	291	M30	1545	---	1653	---	---
7/8	606	668	---	400	300	468						
1"	909	995	---	718	416	---						

* 1 ft-lbf = 1.356 N-m

* Optimum thread engagement should be approximately 1.5 times the bolt diameter for steel and 2.0 times for aluminum
* Decrease tightening torque by 50% when using bolt in non-heat treated aluminum

TPCA62 PIN HUB CLAMP COMPONENTS

DET.	QTY.	DESCRIPTION	BTM NO.
1	1	TPCA62: BODY - CHICKLET SWITCH	CHART "A"
2	1	TPCA62: END CAP - CHICKLET SWITCH	CHART "A"
3	1	TPCA62: PISTON	PD234403A
4	1	TPCA62: ADJUSTING GUIDE	PD234404A
5	1	TPCA62: PISTON ROD	PD234405A
6	1	TPCA62: FRONT ADJUSTABLE CUSHION	PD234406A
7	1	TPCA62: REAR ADJUSTABLE CUSHION	PD234407A
8	1	TPCA62: THREADED ADJUST ROD	PD234408A
9	1	TPCA62: ADJUSTING SHIM	CONTACT BTM
10	2	TPC62: LINK - 3/8 PIN	795608A
11	1	TPC62: SLIDE BLOCK	795611A
12	1	TPC62: DRIVE ARM	795612A
13	2	TPC62: HUB	795613A
14	2	TPC62: LINK PIN - 3/8 DIA.	795614A
15	8	TPCA62: ARM MOUNT PIN	PD234454A
16	1	STC52AWEC: ANTI-ROTATE PLUG	776204A
17	2	UPCP - UNLOCK PLUG	772601A
18	1	MUCP82: FRONT COVER	741801A
19	1	TPC62: FRONT COVER GASKET- CORK/BUNA-N	795601J
20	1	PARKER U-CUP PACKING	017536
21	2	POLYPAK SEAL	019128
22	1	POLYSEAL: SQB	019187
23	2	PARKER V6 CUSHION SEAL	017538
24	2	URETHANE O-RING	018695
25	2	O-RING	012133
26	1	O-RING: 2-143 N674-70	018653
27	3	O-RING	001417
28	1	O-RING	020606
29	1	1/8 NPT LEVL-SEAL PIPE PLUG	014269
30	2	EXTERNAL RETAINING RING	000997
31	4	EXTERNAL RETAINING RING	001238
32	2	1/4 DIA. x 1" LG. ROLL PIN	000875
33	2	1/8 DIA. x 1/2 LG. ROLL PIN	016350
34	4	SHCS: M4X0.7 X 12	017973
35	4	SHCS: M6X1.0 X 50	014741
36	2	SHCS: M4X0.7 X 35	018486
37	1	TPCA62 OPEN ANGLE STICKER	PD234450A
38	1	TPCA42 END CAP ADJ. STICKER	PD253351A

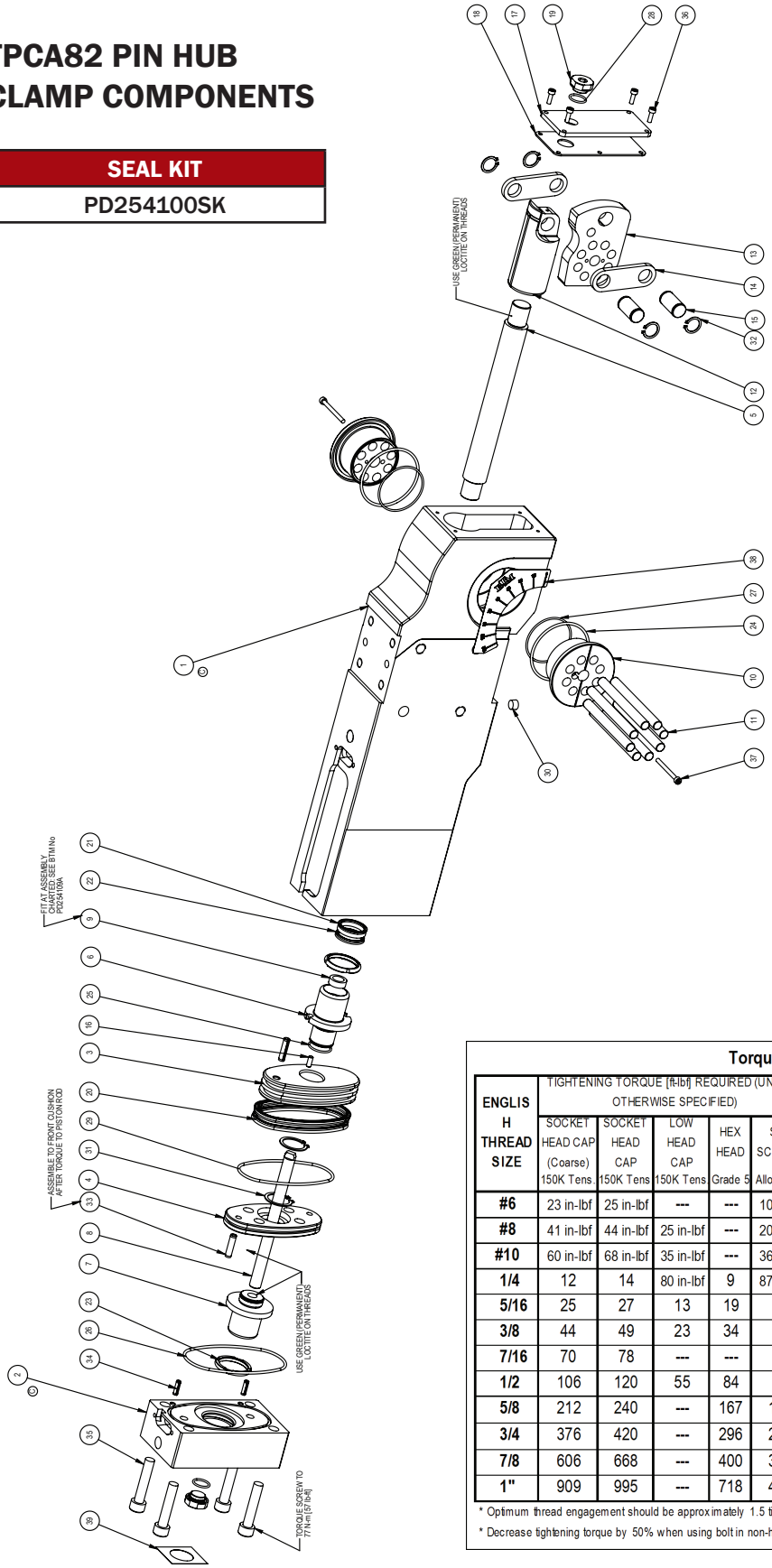
CHART "C"

1.) CLAMP BODY - CHICKLET SWITCH	
BTM No.	Description
PD234452A	TPCA62: BODY 1/4 NPT - CHICKLET SWITCH
PD234903A	TPCA62: BODY G1/4 - CHICKLET SWITCH

2.) END CAP - CHICKLET SWITCH	
BTM No.	Description
PD234453A	TPCA62: END CAP 1/4 NPT - CHICKLET SWITCH
PD234904A	TPCA62: END CAP G1/4 - CHICKLET SWITCH

TPCA82 PIN HUB CLAMP COMPONENTS

SEAL KIT
PD254100SK


USE GREEN (PERMANENT) LOCTITE ON THREADS
FIT AT ASSEMBLY CHARTED; SEE BTM No PD254109A
ASSEMBLE TO FRONT CUSHION AFTER TORQUE TO PISTON ROD
USE GREEN (PERMANENT) LOCTITE ON THREADS
TORQUE SCREW TO 77 N-m [57 lb-ft]

Torque Chart - English & Metric Rev 3 (27 May 2005)

ENGLISH THREAD SIZE	TIGHTENING TORQUE [ft-lbf] REQUIRED (UNLESS OTHERWISE SPECIFIED)						METRIC THREAD SIZE	TIGHTENING TORQUE [ft-lbf] REQUIRED (UNLESS OTHERWISE SPECIFIED)				
	SOCKET HEAD CAP (Coarse) 150K Tens	SOCKET HEAD CAP 150K Tens	LOW HEAD CAP 150K Tens	HEX HEAD Grade 5	SET SCREWS Alloy Steel	SHOULDER SCREWS 160K Tens.		SOCKET HEAD CAP Grade 12.9	LOW HEAD CAP Grade 10.9	HEX HEAD Grade 10.9	SET SCREWS Alloy Steel	SHOULDERSCREWS 160K Tens.
#6	23 in-lbf	25 in-lbf	---	---	10 in-lbf	---	M4	39 in-lbf	40 in-lbf	32 in-lbf	19 in-lbf	---
#8	41 in-lbf	44 in-lbf	25 in-lbf	---	20 in-lbf	---	M5	78 in-lbf	75 in-lbf	64 in-lbf	35 in-lbf	60 in-lbf
#10	60 in-lbf	68 in-lbf	35 in-lbf	---	36 in-lbf	---	M6	11	10	12	64 in-lbf	9
1/4	12	14	80 in-lbf	9	87 in-lbf	9	M8	27	25	29	12	19
5/16	25	27	13	19	13	19	M10	53	51	57	24	42
3/8	44	49	23	34	24	32	M12	93	88	100	40	74
7/16	70	78	---	---	35	---	M16	230	220	247	99	177
1/2	106	120	55	84	51	83	M20	450	425	480	175	347
5/8	212	240	---	167	110	165	M24	777	---	834	321	---
3/4	376	420	---	296	200	291	M30	1545	---	1653	---	---
7/8	606	668	---	400	300	468						
1"	909	995	---	718	416	---						

* 1 ft-lbf = 1.356 N-m

* Optimum thread engagement should be approximately 1.5 times the bolt diameter for steel and 2.0 times for aluminum
* Decrease tightening torque by 50% when using bolt in non-heat treated aluminum

TPCA82 PIN HUB CLAMP COMPONENTS

DET.	QTY.	DESCRIPTION	BTM NO.
1	1	TPCA82: BODY - CHICKLET SWITCH	CHART "C"
2	1	TPCA82: END CAP - CHICKLET SWITCH	CHART "C"
3	1	TPCA82: PISTON	PD254103A
4	1	TPCA82: ADJUSTING GUIDE	PD254104A
5	1	TPCA82: PISTON ROD	PD254105A
6	1	TPCA82: FRONT ADJUSTABLE CUSHION	PD254106A
7	1	TPCA82: REAR ADJUSTABLE CUSHION	PD254107A
8	1	TPCA82: THREADED ADJUST ROD	PD254108A
9	1	TPCA82: ADJUSTING SHIM	CONTACT BTM
10	2	TPC82: PIN HUB	795703A
11	8	TPC82: ARM MOUNT PIN - 76MM	795706A
12	1	TPC82: SLIDE BLOCK	795707A
13	1	TPC82: DRIVE ARM	795708A
14	2	TPC82: LINK	795709A
15	2	TPC82: LINK PIN	795710A
16	1	STC52AWEC: ANTI-ROTATE PLUG	776204A
17	1	TPC82: FRONT COVER	795701J
18	1	TPC82: FRONT COVER GASKET- CORK/BUNA-N	795702J
19	2	UPCP - UNLOCK PLUG	772601A
20	2	POLYPAK SEAL	019129
21	1	POLYPAK SEAL	019430
22	1	POLYPAK SEAL	034347
23	2	PARKER V6 CUSHION SEAL	018461
24	2	URETHANE O-RING	018696
25	1	O-RING	012131
26	1	O-RING	018459
27	2	O-RING	018093
28	2	O-RING	001417
29	1	SEAL: O-RING 2-152 N674-70	024247
30	1	1/8 NPT LEVL-SEAL PIPE PLUG	014269
31	2	EXTERNAL RETAINING RING	000173
32	4	EXTERNAL RETAINING RING	027576
33	2	1/4 DIA. x 1" LG. ROLL PIN	000875
34	2	3/16 DIA. x 5/8 LG. ROLL PIN	001645
35	4	SHCS: M10X1.5 X 50	017050
36	4	SHCS: M4X0.7 X 12	017973
37	2	SHCS: M4X0.7 X 45	017455
38	1	TPCA82 OPEN ANGLE STICKER	PD254150A
39	1	TPCA42 END CAP ADJ. STICKER	PD253351A

CHART "C"

1.) CLAMP BODY - CHICKLET SWITCH	
BTM No.	Description
PD254152A	TPCA82: BODY - 1/4 NPT -CHICKLET SWTICH
PD254303A	TPCA82: BODY - G1/4 - CHICKLET SWITCH

2.) END CAP - CHICKLET SWITCH	
BTM No.	Description
PD254153A	TPCA82: END CAP - 1/4 NPT - CHICKLET SWTICH
PD254304A	TPCA82: END CAP - G1/4 - CHICKLET SWITCH

Potential Failure Mode and Effects Analysis
Machinery FMEA (MFMEA)

QF 4.2.2 REV.2

Prepared By: A. Sanders

Ass'y. Number: Various
Ass'y. Description: TPCA Adjustable Clamp
Customer: BTM Standard
B/P Date/Lev: 2011-08-30
Approved By:

Subsystem Name/Function & Performance Requirements	Potential Failure Mode(s)	Potential Effect(s) of Failure	Sev	Potential Cause(s)/ Mechanism(s) of Failure	Occ	Current Design & Machinery Controls	Det	RPN	Recommended Corrective Action(s)	Person Responsible & Completion Date	Action Results: Action(s) Taken	New Sev	New Occ	New Det	New RPN
TPCA62 Tri-Lok Clamp															
Provide material clamping for fabrication systems located in welding environments (1700 to 2280 in-lbs. Torque @ 60 to 80 P.S.I.) If BTM design guidelines are maintained	Loss of clamping torque	Workpiece not held with enough force and/or parts slip from fixture during work **Degraded output and/or impaired performance**	5	Defective, Worn or damaged piston seals **MTTR 30 min**	1	(P) Parker Polypak seals used (D) Air bypass detected at valve (D) Visual check of arm movement	5	**25**							
			5	Broken Trilok mechanism part (Drive arm, link, etc.) **MTTR 30 min Replace Clamp**	1	(P) Always refer to User's Guide for maximum loads attached to arm (P) Machined orifice in end cap and body (D) Sensing of Prox target in open/closed position	2	**10**							
			4	Defective or damaged proximity sensor seals **MTTR 10 min Replace seal**	1	(D) Air bypass detected around switch cover plate (D) Visual check of arm movement	5	**20**							
			3	System air pressure below 60psi **MTTR 10 min restore proper system pressure.**	1	(D) Visual inspection of pressure gauges (D) Pressure sensors	4	**12**							
Remain locked in the clamped or closed position if air pressure is lost (4000 in-lbs. Torque Holding Capacity) If BTM design guidelines are maintained	Will not remain locked in closed position when air is lost	Workpiece may fall out of fixture in overhead applications **Machinery breakdowns**	5	Defective, Worn or damaged piston seals **MTTR 30 min**	1	(P) Parker Polypak seals used (D) Air bypass detected at valve (D) Visual check of arm movement	5	**25**							
			5	Broken Trilok mechanism part (Drive arm, link, etc.) **MTTR 30 min Replace Clamp**	1	(P) Always refer to User's Guide for maximum loads attached to arm (P) Machined orifice in end cap and body (D) Sensing of Prox target in open/closed position	2	**10**							
			4	Defective or damaged proximity sensor seals **MTTR 10 min Replace seal**	1	(D) Air bypass detected around switch cover plate (D) Visual check of arm movement	5	**20**							

Potential Failure Mode and Effects Analysis
Machinery FMEA (MFMEA)

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			3	System air pressure below 60psi **MTTR 10 min restore proper system pressure.**	1	(D) Visual inspection of pressure gauges (D) Pressure sensors	4	**12**							
Provide a precision backup location of a nest block or fixture block (90 deg. +/-3' Repeatability) (90 deg. +/-15' interchangeability) If BTM design guidelines are maintained	Loss of locational repeatability to N/C surface	Workpiece out of specification **Degraded output, partial or complete loss of function**	5	Defective, Worn or damaged piston seals **MTTR 30 min**	1	(P) Parker Polypak seals used (D) Air bypass detected at valve (D) Visual check of arm movement	5	**25**							
			5	Broken Trilok mechanism part (Drive arm, link, etc.) **MTTR 30 min Replace Clamp**	1	(P) Always refer to User's Guide for maximum loads attached to arm (P) Machined orifice in end cap and body (D) Sensing of Prox target in open/closed position	2	**10**							
			4	Defective or damaged proximity sensor seals **MTTR 10 min Replace seal**	1	(D) Air bypass detected around switch cover plate (D) Visual check of arm movement	5	**20**							
			3	System air pressure below 60psi **MTTR 10 min restore proper system pressure.**	1	(D) Visual inspection of pressure gauges (D) Pressure sensors	4	**12**							
Provide arm rotation to allow clearance of material as it is loaded and unloaded into the fixture (30 to 120 degree arm rotation available) If BTM design guidelines are maintained	Arm rotates less than required	Part interferes with arm when loading or unloading **Machinery breakdowns,loss of production during operation**	5	Defective, Worn or damaged piston seals **MTTR 30 min**	1	(P) Parker Polypak seals used (D) Air bypass detected (D) Visual check of arm movement	5	**25**							
			5	Broken Trilok mechanism part (Drive arm, link, etc.) **MTTR 30 min Replace Clamp**	1	(P) Always refer to User's Guide for maximum loads attached to arm (P) Machined orifice in end cap and body (D) Sensing of Prox target in open/closed position	2	**10**							
			4	Defective or damaged proximity sensor seals **MTTR 10 min Replace seal**	1	(D) Air bypass detected around switch cover plate (D) Visual check of arm movement	5	**20**							

Potential Failure Mode and Effects Analysis
Machinery FMEA (MFMEA)

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												Action(s) Taken	New Sev	New Occ	New Det	New RPN
				3	System air pressure below 60psi **MTTR 10 min restore proper system pressure.**	1	(D) Visual inspection of pressure gauges (D) Pressure sensors	4	**12**							
	Arm remains in closed position when open signal is sent	Part remains in fixture unintentionally **Loss of production during operation, loss of function**		5	Defective, Worn or damaged piston seals **MTTR 30 min**	1	(P) Parker Polypak seals used (D) Air bypass detected at valve (D) Visual check of arm movement	5	**25**							
				5	Broken Trilok mechanism part (Drive arm, link, etc.) **MTTR 30 min Replace Clamp**	1	(P) Always refer to User's Guide for maximum loads attached to arm (P) Machined orifice in end cap and body (D) Sensing of Prox target in open/closed position	2	**10**							
				4	Defective or damaged proximity sensor **MTTR 10 min Replace Proximity Sensor**	2	(D) Machine controls will inherently be alerted of damaged sensor	3	**24**							
				4	Defective or damaged proximity sensor seals **MTTR 10 min Replace seal**	1	(D) Air bypass detected around switch cover plate (D) Visual check of arm movement	5	**20**							
				3	System air pressure below 60psi **MTTR 10 min restore proper system pressure.**	1	(D) Visual inspection of pressure gauges (D) Pressure sensors	4	**12**							
	Arm remains in open position when close signal is sent	Part will not be clamped in next cycle **Loss of production during operation, loss of function**		5	Defective, Worn or damaged piston seals **MTTR 30 min**	1	(P) Parker Polypak seals used (D) Air bypass detected at valve (D) Visual check of arm movement	5	**25**							
		Surrounding equipment interferes with arm **Machinery breakdowns,loss of production during operation**		5	Broken Trilok mechanism part (Drive arm, link, etc.) **MTTR 30 min Replace Clamp**	1	(P) Always refer to User's Guide for maximum loads attached to arm (P) Machined orifice in end cap and body (D) Sensing of Prox target in open/closed position	2	**10**							

Potential Failure Mode and Effects Analysis
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				4	Defective or damaged proximity sensor **MTTR 10 min Replace Proximity Sensor**	2	(D) Machine controls will inherently be alerted of damaged sensor	3	**24**							
				4	Defective or damaged proximity sensor seals **MTTR 10 min Replace seal**	1	(D) Air bypass detected around switch cover plate (D) Visual check of arm movement	5	**20**							
				3	System air pressure below 60psi **MTTR 10 min restore proper system pressure.**	2	(D) Visual inspection of pressure gauges (D) Pressure sensors	4	**24**							
	Arm interferes with clamp body	Stop arm from fully opening **Partial or complete loss of function**		5	Incorrect machining of clamp arm u-cut **MTTR 15 min. Replace STC clamp arm**	2	(P) ES Testing, Functional test each clamp, Pre-ship validation (D) Sensing of Prox target in open/closed position	2	**20**							
	Clamp is "slamming' in open or closed positions **Excessive noise**	**Excessive noise, Machinery breakdowns**		2	No flow controls are installed or misadjusted **MTTR 30 min Add or adjust flow controls**	2	(P) Machined orifice in end cap and body (D) Noise will be evident.	2	**8**							

WARRANTY INFORMATION

BTM Company, LLC. warranties its TPCA Clamps against defects in material and workmanship for the life of the tool/program which the clamp was originally sold or 3 million cycles, whichever comes first.

This warranty is limited to replacing or repairing at BTM's option, F.O.B. BTM's factory, any part found by BTM to be defective in materials and/or workmanship. Any application of a BTM product outside the intended use of the product shall not be warranted by BTM Company, LLC.. Furthermore, BTM will not be liable for any expenses incurred for repairs or replacement made outside BTM's facilities without written consent (or damages arising out of such replacements or repairs). Under no circumstances will BTM be held responsible for any consequential damages.
The warranty is limited to the repair or replacement of the defective part(s) and does not include installation.

This warranty is the only warranty extended by the seller in connection with any sale made hereunder and is in lieu of all other warranties, express, implied or statutory including warranties of merchantability and fitness for purpose.

OTHER QUALITY BTM POWER CLAMPS

In addition to the TPCA line of Power Clamps, BTM also manufactures clamps for a variety of applications. Listed below are a few examples of additional BTM power clamps that are available for purchase:

OTHER WELD ENVIRONMENT CLAMPS

TPC-32 CLAMP

BTM's TPC-32 is a sealed, light weight, pneumatically operated power clamp which features a 32mm bore and a three point locking mechanism.

SEALED OFFSET (SO) CLAMPS

BTM's SO Clamps feature a sealed mechanism which is protected against weld spatter, dirt, chips, and coolants. BTM SO clamps are manufactured from a one-piece body for true alignment; and for increased versatility, BTM's SO clamps allow the arm to be mounted in 8 positions on each side of the clamp. Adjustable Arm Position (AAP) or Over Center Locking (OCL) options are also available.

GENERAL CLAMPING

PC SERIES POWER CLAMPS

Rugged & Reliable, BTM's PC series of clamps are designed to provide high clamping forces and long work life within a compact, lightweight unit. The one-piece body eliminates premature wear due to misalignment; and binding.

LIGHT DUTY CLAMPING

100 SERIES CLAMPS

These cost-effective 25mm bore clamps are designed for high production. Most models feature a manually positionable rotating head which locks into place when mounting screws are tightened, eliminating the need for angled mounting surfaces.

SPECIALTY CLAMPING

ASK ABOUT OUR ROTARY-LINEAR CLAMPS!

www.btmcomp.com/clamp-solutions.html

BTM COMPANY

OTHER PRODUCTS FOR AUTOMATION

Clamps

From heavy duty precision sealed locking power clamps to simple light duty OMNI models, BTM manufactures clamps in a range of styles and sizes for a wide variety of applications.

Grippers

BTM manufactures a high quality line of grippers ranging from heavy duty models to light duty models in a variety of styles and sizes.

OTHER QUALITY BTM PRODUCTS TO CONSIDER

Pin Locator Clamps

BTM's Locator Clamps are ideal for locating & holding production material and are used in a variety of manufacturing areas including automotive & refrigeration.

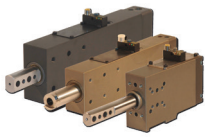
Pin Sizes range from as small as 6mm (PLC-25 Light Duty Clamp) to as large as 40mm (PLC-63 & LPLC-38 locking clamp).

Single Finger Hook Models (without the locating pin) are also available in both locking and non-locking configurations.

Rod-Locking Pin Locator Clamps

These clamps employ a rod locking feature which allows the clamp to retain the part when air pressure is removed/lost.

Precision Shot Pin Cylinders



BTM's Precision Shot Pin Cylinders are ideal for locating production material through precisely pierced holes - including clamping and fixturing.

For more information, or to view our other products, please visit:

www.BTMcomp.com